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ABSTRACT

This instructor's lesson plan guide on the respiratory system is one of fifteen modules designed for use in the training of emergency medical technicians (paramedics). Five units of study are presented: (1) anatomy and physiology of the respiratory system; (2) pathophysiology assessment of the patient; (3) pathophysiology and management of respiratory problems; (4) techniques of management including administration of oxygen, suctioning, use of nebulizers, direct laryngoscopy, and endotracheal intubation; and (5) clinical experience in the intensive care unit, operating room, and morgue. Each unit contains these elements: behavioral objectives, teaching procedures, a content outline, demonstration outline, list of needed equipment and materials, and guidelines for activities to be performed by students applying the skills. Skill evaluation sheets are provided. (It is suggested that each module can be presented individually or combined with other modules to construct a course for a selected group of students. CE 017 514 is a course guide for use in program planning and administration of the modules.) (JH)

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CE 017 519

 National Training Course
EMERGENCY MEDICAL TECHNICIAN
PARAMEDIC
INSTRUCTOR'S LESSON PLANS
Module **V**
Respiratory System



U. S. Department of Transportation / National Highway Traffic Safety Administration

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HOW TO USE THE INSTRUCTOR LESSON PLANS

The *Instructor Lesson Plans* are guides for teaching an advanced-level training program for emergency medical technicians. The *Plans* cannot be used by the instructor to develop the competency to conduct the program; the instructor should have this as a prerequisite to teaching the course.

The *Instructor Lesson Plans* are comprised of 15 modules, each containing the information and instructions needed to conduct a program on a particular subject. Each module can be used by itself or in concert with other modules.

Each module is subdivided into instructional units that deal with a particular segment of the module subject. Generally, the units contain the following components:

- **Performance Objectives.** These are classified as knowledge (K) objectives or skill (S) objectives. They are written in behavioral terms so they can be evaluated either through observation of student activities or through results obtained under specified conditions.
- **Unit Activities.** Reading assignments, reference materials, and outside activities are presented for both the students and the instructor. If the activities are identical, only the instructor's activities are presented.
- **Equipment and Materials.** Educational equipment includes chalkboard, overhead projector, slide projector, and screen. Medical equipment and materials required are drawn from those listed in Appendix F of the *Course Guide*.

NOTES

- *Content Outline.* This presents the topics to be covered during the presentation of the unit. Where appropriate, it is divided into single skills or concepts. This approach gives the instructor the flexibility to add or delete specific skills and information. The content outline also provides directions to the instructor indicating when the use of demonstrations or group discussions would be most appropriate.

Because the units are designed to be taught by technically competent instructors, the content outlines are not specific; they only enumerate topics and subtopics. It is expected that the instructor's skill and knowledge will supplement the depth of the course content outline. The instructor is encouraged to prepare additional notes.

- *Demonstration Outlines.* These are designed to present procedural steps that are important in performing the particular skill or calculation. Steps that are critical or that may lead to common errors are emphasized. Where critical steps exist, these outlines suggest what should be demonstrated.
- *Practice Sessions.* These sessions serve as guides to activities to be performed by students applying the skills. They may be performed in the classroom or assigned as homework. During classroom practice sessions, the instructor will be available to observe and correct student performance and to answer any questions.
- *Skill Evaluations.* The skill evaluation sheets provide checkpoints for the instructor to use to insure that students are following appropriate procedures or sequences. Skill evaluation sheets also provide a convenient method for feedback to students having particular problems with a given skill, and for monitoring a student's progress in attaining skill objectives.

The skill evaluation should occur only after the students have had an opportunity to practice the skill under the supervision of the instructor. The skill evaluation sheets can be distributed during, or before, the demonstration or practice session. Thus, they can be used as a job aid during practice. They should not be used, however, as a job aid while the student is being evaluated. The sheets are designed to provide a learning and evaluation tool

and are not intended to mandate performance in the field in a set manner, irrespective of the patient's condition or situation.

Satisfactory performance of a given skill is defined as the correct performance of all steps in the proper sequence. The instructor's judgment is required to define correct performance and sequence of steps in a skill. Skill evaluations may be repeated at intervals throughout the course to assess skill decay and the need for remedial practice. Some instructors may wish to test skills immediately after they have been learned and again at the conclusion of the course.

The alphanumeric coding system is used to identify the various modules and units. When you see, for example, in Module II, 3.6.1.K, the 3 indicates the unit, the 6 indicates the main instructional topic, the 1 indicates the subsection of the major topic outlined in 3.6, and the K indicates the teaching objective (in this case, knowledge).

To illustrate further, 3.6.1.K would translate into:

3 = Unit number

6 = The main topic of the instructional section (The first two numbers—e.g., 3.6—refer to a major heading in the unit content outline.)

1 = A subsection of the major topic outlined in 3.6 (This number relates to the number of objectives listed under skill or knowledge objectives and not to the content outline.)

K = Knowledge objective

S = Skill objective

The three-digit reference numbers (e.g., 3.6.1) within each module refer to the topical section in that module only. For example, in Module II, any topical heading with 3.6 as the first two digits refers to the discussion of the components of patient assessment in Unit 3.

A visual presentation of Unit 3, by Module II, of the coding system is presented on the following pages.

SAMPLE PAGE

CODING SYSTEM EXAMPLES

NOTES

-
- Abdomen
 - Extremities

3.6.1.K Given a situation describing a patient with a possible illness or injury who may or may not be able to communicate, the student should be able to describe the procedure for evaluating the patient described. Minimally, the student should include the appropriate primary assessment and specify the order of the four components of the secondary assessment and the areas of the assessment that would be emphasized.

the demonstration, auscultation of the lung, heart, and abdominal sounds.

3.6.1.S Given a student posing as a communicative patient, the student should be able to demonstrate the procedure for conducting a patient assessment when the patient is suspected of having the following:

SAMPLE PAGE

CODING SYSTEM EXAMPLES

NOTES

8. Practice Session 3

3.6. Four components of assessment (order)

- A. If the patient can communicate, determine if he has a medical or trauma-related problem.
1. If a medical problem, the general order should be:
 - a. Evaluate the diagnostic and vital signs.
 - b. Develop the patient's history.
 - c. Examine for a medical problem.
-
-

Skill Evaluation 3.6.1.S: Assessment of a Communicative Patient With a Suspected Trauma-Related Problem

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Student posing as a victim
Stethoscope

Clinical Training

To present this program, it will be necessary to have access to the clinical units listed below. If a unit is not available, adjustments should be made to insure that the activities proposed for that unit are included in others. Specific guidelines for the clinical units are included in the modules. The student's training should be supervised in each of the following clinical areas:

- Emergency department
- Intensive care unit/coronary care unit
- Operating/recovery room
- Intravenous (IV) team
- Pediatric unit
- Labor suite/delivery room/newborn nursery
- Psychiatric unit
- Morgue
- Mobile intensive care unit

Sample forms for maintaining student activity records are included in the *Instructor Lesson Plans*. The forms are designed so that the medical director can determine the number of times, and how successfully, a student has performed a skill. The medical director also will be able to determine how much time the student needed to become proficient in the skill. Further, the medical director will be able to evaluate student performance under a number of preceptors, because certain skills are repeated in various clinical units (e.g., initiating an IV is performed by the student with the IV team and in the emergency department and intensive care unit).

Although the clinical experience is listed with the module, it need not be presented each time, even if a number of modules are being presented.

Testing and Evaluating the Student

It is recommended that each student be evaluated on proficiency of skill and knowledge at the completion of each module. Skill evaluation sheets have been provided for each skill in each unit. These sheets can be used as guides for evaluating the student's skill proficiency. The evaluation of the knowledge objectives is left to the discretion of the instructor, according to predetermined objectives.

NOTES

Testing of knowledge should stress areas of clinical relevance over basic science. No matter what type of evaluation system is used, students should be kept informed of their progress and should be given additional activities to supplement weak areas.

As previously stated, the emphasis is on student competency, rather than on the total number of hours the student is involved in the program. Thus, it is possible for the student to be tested and given credit for any module. The medical director should not assume the student's competency simply because of prior training, but should develop an evaluation method to determine the student's proficiency based on first-hand observation and experience. With this type of method, it is possible for students to receive credit for prior training experience. This would be especially applicable for those modules that are primarily a review of skills concerned with Emergency Medical Technician-Ambulance; for example, soft-tissue injuries and rescue.

MODULE V RESPIRATORY SYSTEM

INTRODUCTION

Prerequisites

The students must have successfully completed the following modules:

- I. The Emergency Medical Technician, His Role, Responsibilities, and Training
- II. Human Systems and Patient Assessment
- III. Shock and Fluid Therapy
- IV. General Pharmacology

Description of Module

Following is a summary of the topics discussed in this module:

Unit 1. Anatomy and Physiology of the Respiratory System: Provides the foundation for the rest of the module by discussing the specific anatomical structures involved in normal respiratory function and the mechanics of respiration.

Unit 2. Patient Assessment: Points out that before any treatment can be initiated, the Emergency Medical Technician (EMT) must be able to accurately assess the specific pathophysiology in a patient. Building on previous knowledge gained in Unit 1, the student is

taught what information must be obtained and what techniques should be used to gather that information. The skills of inspection, auscultation, percussion, and palpation are demonstrated, practiced, and evaluated in this unit.

Unit 3. Pathophysiology and Management of Respiratory Problems: Deals with problems of respiratory distress and the management of those problems. As a variety of specific problems are identified, the student is taught why these problems have emerged. Once the student understands why certain medical and trauma-related problems have occurred, specific patient management techniques are explored.

Unit 4. Techniques of Management: Emphasizes seven different skills, as well as new knowledge relating to them.

- Administration of oxygen
- Use of adjuncts to respirations
- Demand-valve/hand-triggered ventilation device
- Suctioning
- Use of nebulizers
- Direct laryngoscopy
- Endotracheal intubation
- Esophageal obturator airway*
- Chest decompression (pleural drainage)*
- Use of positive-end expiratory pressure devices*
- Cricothyroidotomy*
- Transtracheal jet insufflation*
- Heimlich maneuver*

Unit 5. Clinical Experience: Includes experience in the following:

- Intensive care unit
- Operating room
- Morgue

*Indicates optional skills and should only be incorporated in the program after careful review of local medical practices and resources.

UNIT 1

emt-p

ANATOMY AND PHYSIOLOGY OF THE RESPIRATORY SYSTEM

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

1.1.1.K Given a picture of the upper respiratory tract, the student should be able to identify and describe at least one function of the following structures:

- Nasal cavities
- Nasal septum
- Turbinates
- Palate
- Uvula
- Adenoid tonsils
- Pharynx
- Larynx
- Cricoid and thyroid cartilages
- Epiglottis
- Tongue
- Glottis
- Vocal cord
- Trachea
- Esophagus

1.1.2.K Given a picture of the lower respiratory tract, the student should be able to identify and label each of the following structures:

- Trachea
- Left and right mainstem bronchi
- Esophagus
- Tracheal rings
- Carina
- Bronchioles
- Alveoli

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

NOTES

- Lung
- Pleura
- Pleural space
- Diaphragm
- Apex

- 1.2.1.K Given a list of muscles, the student should be able to recognize those primarily involved in respiration.
- 1.2.2.K Given a list of muscles, the student should be able to recognize those involved in the modification of chest diameter in the respiratory cycle.
- 1.2.3.K Given a list of phases of the respiratory cycle, the student should be able to select the phase during which intrathoracic pressure is higher than atmospheric pressure.
- 1.2.4.K Given a list of respiratory system structures, the student should be able to list the sequence in which they come in contact with inspired air.
- 1.2.5.K Given a list of respiratory cycle phases, the student should be able to determine which phases are active and which are passive.
- 1.2.6.K Given that the respiratory rate may vary, the student should be able to list five causes of change in the respiratory rate.
- 1.2.7.K Given a list of anatomical parts of the brain, the student should be able to select the anatomical part in which the respiratory center is located.
- 1.2.8.K Given a list of muscles, the student should be able to select the muscles receiving impulses from the respiratory center.
- 1.2.9.K Given a list of respiratory system structures, the student should be able to determine in which structures the stretch receptors are located and describe their function.
- 1.2.10.K Given a list of minute volumes, the student should be able to select the minute volume for a patient with a tidal volume of 650 cubic centimeters (cc) and a respiratory rate of 12 per minute.

- 1.2.11.K Given a list of arterial oxygen concentrations, the student should be able to select the normal PO_2 for a young adult breathing air.
- 1.2.12.K Given a list of arterial carbon dioxide concentrations, the student should be able to select the normal PCO_2 .
- 1.2.13.K Given an increase in arterial PCO_2 , the student should be able to name this condition and describe its effect on respiratory activity and on blood pH in the normal individual.
- 1.2.14.K Given a decrease in arterial PO_2 , the student should be able to name this condition and describe its effect on respiratory activity in the normal individual.
- 1.2.15.K Given an increase in CO_2 production, the student should be able to list at least two ways in which this increase may occur.
- 1.2.16.K Given an increase in CO_2 elimination, the student should be able to describe how this elimination can occur.
- 1.2.17.K Given a list of specialized respiratory functions including, but not limited to, coughing and sneezing, the student should be able to identify the respiratory structures involved and describe at least one purpose for each function.

Instructor Activities

Assign the material referred to below during the class period immediately before beginning the unit:

- Chapter 5, Unit 1, of the *Text*
- Knowledge objectives for this unit

Prepare a lecture following the content outline on page V-7. Some suggested instructional techniques follow:

- Introduction: List the topics to be discussed on the chalkboard and leave them there during the entire unit.

- 1.1A: Draw a diagram of the entire upper respiratory tract or use a commercial flipchart to point out all structures.
- 1.1B: Draw a diagram of the entire lower respiratory tract or use a commercial flipchart to point out all structures.
- 1.2A2: Ask the students how inspiration is initiated and what muscles are involved.
- 1.2A2: Ask the students for the result of lung contour change.
- 1.2A3: Ask the students for the result of the relaxation of the respiratory muscles.
- 1.2B: Draw a diagram that clearly depicts the pulmonary circulatory system or use a commercial diagram that can be seen by all the students. Use this to point out all structures.
- 1.2D: Ask the students for examples of factors that influence respiratory rate.
- 1.2D7: Provide the students with tidal volume examples and sample respiratory rates, and have them compute minute volumes.
- 1.2F: Ask the students to list some specialized respiratory functions and describe them.
- 1.2G: In summarizing the lesson, briefly discuss the topics listed and ask the students questions. When summarizing each section, invite questions concerning subject matter. If such questions arise, attempt to have other students answer them.

Test the students. The objectives should be used as a guide to develop the evaluation.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk
Anatomy diagrams

Equipment—Medical

None

Materials

Knowledge objectives (optional)

Written examination

Answer sheets and pencils

Text

Content Outline

Introduction

- Briefly introduce the anatomy of the upper respiratory tract.
- Briefly introduce the anatomy of the lower respiratory tract.
- Briefly introduce the mechanics of respiration.
- Write topics on the chalkboard.

1.1. Anatomical structure

A. Upper respiratory tract (draw a diagram or use a chart)

1. Air enters through the nasal cavities.
 - a. Point out that they are separated by the nasal septum.
 - b. Point out that scroll-like projections called turbinates create turbulent air flow.
 - c. Point out that they are separated from the mouth by the palate.
2. The uvula is at the end of the palate.
 - a. Point out that it is located in the back of the mouth cavity.
 - b. Point out that below the uvula is the oropharynx.
3. Behind the soft palate are the adenoid tonsils.
4. The deepest portion of the pharynx separates with two distinct openings.
 - a. Immediately behind and below the tongue is the opening to the larynx, the passage to the trachea, bronchi, and lungs, guarded by the cartilaginous epiglottis.
 - b. Behind the laryngeal orifice is the opening of the esophagus, which passes through the chest, behind the trachea.
5. The tongue initiates the process of swallowing.
 - a. The epiglottis is pushed over the opening of the larynx.
 - b. Food particles pass over the epiglottis through the esophageal orifice.

6. Mucous membranes of the upper airway (primarily in the nasal pharynx) provide humidification of inhaled air through evaporation.
 - a. Air is warmed to 37° C (98.6° F) before reaching the lungs.
 - b. Air is filtered in the nasopharynx.
 - c. Irregular cartilages of the nose (turbinates) create a turbulent air flow.
 - d. Foreign matter precipitates to the mucous membrane of the nose and nasopharynx.
 - e. Cilia (hairlike fibers) sweep foreign matter toward the oropharynx where it may be expectorated or swallowed.

B. Lower respiratory tract

1. The trachea begins at the lower end of the larynx.
 - a. Discuss its tubular structure.
 - b. Point out that it is connective tissue reinforced by closely spaced cartilaginous tracheal rings that are:
 - (1) Incomplete and C-shaped
 - (2) Soft where they meet the esophagus
 - c. Point out that it extends down 4 or 5 inches before dividing into the left and right mainstem bronchi.
 - d. Discuss that the respiratory epithelium, the lining of the trachea, contains ciliated and mucus-producing cells.
 - (1) Mucus on the surface of the respiratory epithelium traps particulate matter.
 - (2) The cilia sweep debris upward in an undulatory motion to the larynx where it is swallowed.
2. At the tracheal bifurcation or carina, the left and right bronchi abruptly enter the left or right thoracic cavity or rib cage.
 - a. Point out that the bronchi then subdivide into the secondary bronchi.
 - b. Discuss the three divisions in the right cavity:
 - (1) Upper lobe
 - (2) Middle lobe
 - (3) Lower lobe
 - c. Discuss the two divisions in the left cavity:
 - (1) Upper lobe
 - (2) Lower lobe

3. The secondary bronchi subdivide into bronchioles.
4. The bronchioles subdivide into the small terminal branches, the respiratory bronchioles.
5. The cartilaginous rings gradually disappear at the periphery of the bronchi.
 - a. The walls of the respiratory bronchioles contain only connective muscular tissue.
 - b. Muscle spasms of these muscular tubes (broncho-spasm—i.e., asthma) result in acute obstruction.
6. The respiratory bronchioles open into a grapelike cluster of air sacs or alveoli.
 - a. Point out that they are hollow sacs.
 - b. Point out that they are thin-walled.
 - c. Point out that they are the most important functional unit of the system.
 - d. Point out that oxygenation occurs through the alveoli.
 - (1) The inner surface is in contact with gases entering via the bronchial tree.
 - (2) The capillary system covers the outer surface via terminal branches of the pulmonary artery.
 - (3) Distribution of alveoli provides a large surface area.
 - e. Point out that the sum of all respiratory bronchioles together with air-sac clusters constitutes the substance of the lung.
7. The outer surface of the lung is lined with a thin moist membrane called the visceral pleura. All pleural linings provide a slippery surface to reduce friction during respiration. The inner chest wall is lined with parietal pleura.

1.2. Mechanics of respiration

A. Respiratory cycle

1. Point out that it begins at the midpoint, that position of the thorax after a normal expiration.
 - a. The inside air pressure is equal to atmospheric pressure.
 - b. Inspiration begins from the midpoint.
2. Discuss inspiration. (Ask students how it is initiated and what muscles are involved.)

- a. Point out that it is initiated by the contraction of the diaphragm and the intercostal muscles of the rib cage.
 - b. Point out that it results in:
 - (1) Flattening of the domelike diaphragm toward the abdomen and an increase in the vertical dimensions of the thoracic cavity
 - (2) An elevation of the ribs and an upward-outward motion that increases the front-to-back diameter of the chest
 - c. Point out that the highly elastic lung assumes the contour change, resulting in (ask students for results) larger lung dimensions.
 - (1) The same air volume in the lung occupies a larger space.
 - (2) Air pressure in the lung decreases rapidly.
 - (3) Air is propelled through the nose, pharynx, trachea, bronchi, bronchioles, and alveoli, since atmospheric air pressure is greater than the air pressure within the thorax.
3. Discuss expiration
- a. At the end of inspiration, the inspiratory muscles relax. (Ask students for result)
 - (1) Point out that lungs recoil back to dimensions identical to those prior to the inspiratory act.
 - (2) Point out that this relaxation compresses the air previously inspired, creating a higher air pressure within the thorax.
 - (3) Point out that because air pressure in the thorax is higher than atmospheric air pressure, air is forced out of the lungs.
 - b. Normal expiration is a passive process as opposed to the active process of inspiration.
- B. Pulmonary circulation (draw a diagram of the pulmonary circulatory system)
- 1. Body cells take oxygen from the blood (arterial system) and return carbon dioxide to the blood (venous system).
 - 2. The venous system returns oxygen-poor, carbon-dioxide-rich blood to the right side of the heart.
 - 3. The right ventricle pumps that blood into the pulmonary artery.

- a. The artery bifurcates into left and right branches supplying the respective lungs.
 - b. Both branches rapidly split into smaller vessels and eventually into microscopic pulmonary capillaries that:
 - (1) Spread over the surface of the air sacs, where the blood picks up oxygen (is arterialized)
 - (2) Recombine into sequentially larger vessels forming the pulmonary veins
 - 4. Pulmonary veins empty into the left atrium and then into the left ventricle from which oxygen-rich blood is pumped and circulated through the systemic arterial system.
- C. Gas exchange in the lungs
- 1. Point out that it is normally the opposite of the process that occurs in the exchange of gas in body cells.
 - a. Oxygen diffuses from the air sac into the blood where it combines with the hemoglobin of the red blood cells.
 - b. Carbon dioxide diffuses out of the blood through the air sac wall and into the lungs for excretion.
 - 2. Point out that inspiration and expiration regulate arterial blood gas composition to maintain a precise balance of carbon dioxide and oxygen for metabolic needs.
- D. Control of respiratory rate
- 1. Different levels of body activity result in different oxygen demands. (Ask students for examples)
 - a. Rest requires less oxygen than exercise.
 - b. Chemical, physical, and nervous reflexes control the mechanisms and constantly monitor body oxygen needs.
 - 2. The respiratory center is located in the brain stem.
 - a. Nerve impulses are sent to the diaphragm and intercostal muscles.
 - b. Inspiration is initiated.
 - 3. Microscopic stretch receptors (located in the lung and pleura) stop the inspiratory act.
 - a. Inspiratory stretching activates the stretch receptors.
 - b. Nerve impulses follow afferent pathways and return to the brain stem.

- c. The inspiratory act is curtailed, allowing the elastic recoil of the lung.
- d. The stretch receptors of the lung cease to send impulses to the brain stem.
- e. The cycle begins again with inspiratory impulses originating in the brain stem.
- 4. Carbon dioxide concentration in the blood results in a decrease or increase of inspiratory activity.
 - a. High CO_2 concentration increases respiratory activity.
 - b. Low CO_2 concentration decreases respiratory activity.
 - c. Hypoxemia is the most profound stimulus to respiration in the normal individual.
- 5. Physical factors influence the respiratory center.
 - a. Discuss body temperature.
 - (1) High temperature increases respiratory rate.
 - (2) Low temperature decreases respiratory rate.
 - b. Discuss blood pressure.
 - (1) Low blood pressure increases respiratory rate.
 - (2) High blood pressure decreases respiratory rate.
 - c. Point out that an increase in air pressure within the thorax results in:
 - (1) Expansion of the lungs
 - (2) Activation of the stretch receptors
 - (3) Cessation of inspiratory activity
 - (4) Automatic passive expiration
- 6. Nervous factors influence respiratory activity.
 - a. Voluntary control
 - (1) Initiated in cerebral cortex
 - (2) Vital in voice control
 - (3) Can be emotionally influenced
 - (a) Fright or excitement accelerate respiration.
 - (b) Suspense or apprehension decelerate respiration.
 - b. Involuntary control through reflexes is responsible for normal breathing and the responsiveness of the respiratory system to increased oxygen demand.
- 7. Minute volume is the tidal volume times the respiratory rate per minute.

- a. Discuss tidal volume—volume of air in each breath, normally about 500 cc.
- b. Give the students sample problems
 - (1) Discuss normal minute volume.

$$= 500 \text{ cc} \times 14/\text{min}$$

$$= 7,000 \text{ cc/min}$$

$$= 71/\text{min}$$
 - (2) Point out that it can be varied by fluctuations in either volume or rate.
 - (3) Discuss variations in minute volume in altered PCO_2 .

E. Acid base physiology (review from Module III)

1. Discuss pH as a measure of blood acidity.
 - a. The pH value (number) is inversely proportional to level of acidity.
 - b. Normal pH of human blood is 7.35–7.45.
2. Point out that arterial concentration of CO_2 and O_2 controls the respiratory center of the brain stem.
 - a. Normal concentration of arterial CO_2 ($\text{P}_\text{A}\text{CO}_2$) is 35–45.
 - b. Increase in $\text{P}_\text{A}\text{CO}_2$, hypercarbia, results in a lower pH value and an increase in respiratory activity.
 - c. Decrease in $\text{P}_\text{A}\text{CO}_2$ results in a higher pH value and a decrease in respiratory activity.

F. Specialized respiratory functions

1. Cough reflex as a protective function
 - a. Point out that it is deep inspiration and violent expiration.
 - b. Point out that it is usually caused by an irritation of the respiratory mucosa.
2. Sneezing
 - a. Point out that it has the same function as a cough.
 - b. Point out that air is propelled through the nasal route.
3. Hiccupping
 - a. No useful physiologic purpose
 - b. Spasmodic contraction of diaphragm
 - c. Usually benign and self-limited
4. Sighing
 - a. Slower and deeper than usual inspiration

- b. Followed by prolonged expiration
- c. Useful physiologically
 - (1) Periodic hyperinflation of the lungs
 - (2) Reexpands areas that may have been atelectatic

Summary

- Review the anatomy of the upper respiratory tract.
- Review the anatomy of the lower respiratory tract.
- Review the mechanics of respiration, including:
 - Respiratory cycle
 - Pulmonary circulation
 - Gas exchange in the lungs
 - Control of the respiratory rate
 - Acid base physiology
 - Specialized respiration functions
- Ask for questions.

NOTES

UNIT 2

emt-p

PATIENT ASSESSMENT

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

- 2.1.1.K Given a list of breathing patterns and rates, the student should be able to name the type of breathing described.
- 2.1.2.K Given that a patient is suspected to be experiencing respiratory distress, the student should be able to list the four general techniques to be used in a detailed assessment of that patient, including:
 - Inspection
 - Auscultation
 - Percussion
 - Palpation
- 2.1.3.K Upon successful completion of the previous objective, the student should be able to list at least eight signs of respiratory distress that may be observed.
- 2.1.4.K Given that auscultation has been performed, the student should be able to list at least four abnormal lung sounds that may be heard through auscultation.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

NOTES

- 2.1.5.K Given a list of statements describing four abnormal lung sounds, the student should be able to name each of the four sounds.
- 2.1.6.K Given a list of statements describing four abnormal lung sounds, the student should be able to list the causes of each sound.
- 2.1.7.K Given a list of causes, the student should be able to identify the possible cause of localized wheezing.
- 2.1.8.K Given a diagram of the human body, the student should be able to label those points at which a stethoscope diaphragm should be placed for the auscultation of lung sounds.
- 2.1.9.K Given a diagram of the human body, the student should be able to label the position at which the hands should be placed to assess symmetry of respiratory movement.

Skill Objectives

After completing this module, the student should be able to correctly perform each of the skill objectives. "Correctly" will be defined by the instructor. Skill evaluation sheets are included in the module.

- 2.1.1.S Given an assistant instructor as a patient, the student should be able to observe and record in writing the rates, rhythm, and the presence or absence of:
- Respiratory rate
 - Respiratory rhythm
 - Cheyne-Stokes breathing
 - Kussmaul respirations
 - Chest symmetry
 - Flaring of nostrils
 - Tugging of the trachea or deviation of the trachea
 - Use of accessory neck muscles in respiration

- Jugular vein distention
- Use of intercostal muscles in respiration
- Difficulty in speech
- Noise of respiration, especially in children

2.1.2.S Given an assistant instructor as a patient, the student should be able to percuss both lung fields to determine if they have similar or differing percussion tones.

2.1.3.S Given an assistant instructor as a patient, the student should be able to auscultate the patient and record in writing the presence or absence of abnormal lung sounds by name.

2.1.4.S Given an assistant instructor as a patient, the student should be able to palpate the patient's chest to check for:

- Equal movement of both sides
- Tenderness over the ribs
- Instability over the ribs

NOTE: All palpation steps must be performed for at least two respiratory cycles in order to successfully complete the objectives.

Instructor Activities

Assign the material referred to below during the class period immediately before beginning this unit:

- Chapter 5, Unit 2, of the *Text*
- Skill and knowledge objectives for this unit

Prepare a lecture following the content outline on page V-18. Provide any compatible audiovisual support materials. Some suggested instructional techniques follow:

- Introduction: On a chalkboard, list the topics to be discussed and the skills needed and leave them there during the entire unit.
- 2.1B: Write the outline topic on the chalkboard and ask the

students for a list of things that could be observed. When all correct items are either given to the instructor or taught, these should be written.

- 2.1C: Write the outline topic on the chalkboard and ask the students to indicate what they feel might be found by this method.
- 2.1D: Write the outline topic on the chalkboard and list the sounds that may be heard as they are discussed.

Test the students. The objectives should be used as a guide to develop the evaluation.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

Stethoscope (one per student)

Adult manikin (a student may be used)

Materials

Skill objectives (optional)

Knowledge objectives (optional)

Skill evaluation sheets

Written examination

Answer sheets and pencils

Text

Content Outline

Introduction

- During this unit, the following topics will be discussed:
 - Techniques of assessment
 - a. Inspection
 - b. Auscultation

- c. Percussion
- d. Palpation
- Signs and symptoms that may be observed during assessment
 - a. Nomenclature
 - b. Indications of signs and symptoms
- During this unit, the following skills will be demonstrated, practiced, and evaluated:
 - Inspection of a patient for signs of respiratory distress
 - Auscultation of the lungs to assess signs of abnormal lung sounds
 - Percussion of the lungs to determine equality of percussion tones
 - Palpation of a patient's chest for signs of asymmetry or instability

2.1. Techniques of assessment

- A. Discuss assessment of all patients.
 - 1. Primary assessment (review Module II)
 - a. State of consciousness
 - b. Patency of airway
 - c. Breathing
 - d. Circulation
 - (1) Pulse
 - (2) Hemorrhage (massive)
 - e. Management of life-threatening problems
 - 2. Secondary assessment (review Module II)
 - a. Medical or trauma-related
 - b. Immediate history
 - c. Mental status
 - d. Skin characteristics
 - e. Pulse rate, rhythm, and strength
 - f. Respiratory rate and depth
 - g. Blood pressure
- B. After completing an examination of the head and neck, commence respiratory assessment.
 - 1. Discuss rate and rhythm—write on chalkboard—alternate with consistent rate and volume

- a. 16/min in adults—higher (24/min) in infants
- b. Normal rhythm—inspection = 1/3 respiratory cycle
- c. Cheyne-Stokes breathing, rapid, irregular pattern with periods of apnea
- d. Kussmaul respirations, deep and rapid
2. Point out what to inspect.
 - a. Inspect the chest for shape and symmetry (also bruises in the trauma patient) which may have an effect on lung excursion
 - b. Check for signs of respiratory distress.
 - (1) Flaring of nostrils
 - (2) Tugging of the trachea
 - (3) Use of accessory neck muscles
 - (4) Retraction of intercostal muscles during inspiration
 - (5) Noise of respiration
 3. Check if the patient's speech is indicative of dyspnea.
 4. Watch for products of productive cough.
- C. Discuss auscultation. (write on the chalkboard)
 1. Write lung sounds on the chalkboard.
 2. Discuss abnormal lung sounds.
 - a. Rales—fine, crackling sounds indicating fluid in smaller airways
 - b. Rhonchi—harsher sound indicating fluid in larger airways
 - c. Stridor—harsh, high-pitched sound upon inspiration indicating an upper airway obstruction
 - d. Wheezes—high-pitched, whistling sound of air moving through narrowed airways
 3. Point out that during auscultation:
 - a. Listen posteriorly and anteriorly.
 - b. Compare the left and right sides in each quadrant.
 - c. Note a minimum of eight auscultation points.
 4. Introduce Demonstration 2.1.3.S.
- D. Discuss percussion.
 1. Place the middle finger flat on the chest and tap it with the middle finger of the other hand.
 2. Check for a similarity of pitch at the same level of each lung.

3. Check the apices anteriorly and posteriorly and the bases posteriorly.
- E. Discuss palpation. (write on chalkboard)
 1. Palpate the chest to confirm the findings of an observation.
 - a. Check for equal movement.
 - b. Check for at least two respiratory cycles.
 2. In the trauma patient, palpate over the ribs for tenderness and instability.
 3. Check the trachea for deviation.
 - a. Toward the side of the simple pneumothorax
 - b. Away from the side of the tension pneumothorax
 4. Introduce Demonstrations 2.1.1.S, 2.1.2.S, and 2.1.4.S.

Summary

- During this unit, the following topics were presented:
 - Techniques of assessment
 - Signs and symptoms that may be observed during assessment
- During this unit, the following skills were demonstrated:
 - Inspection for signs of respiratory distress
 - Auscultation of lung sounds
 - Percussion of the chest
 - Palpation of the chest

Demonstrations 2.1.1.S, 2.1.2.S, and 2.1.4.S: Inspection, Percussion, and Palpation of the Chest

Equipment

A student as an assistant

Procedure

While lecturing, have a student assist you in front of the class.
Make sure all students can see and hear the demonstration.

Steps

1. Inspect for symmetry, trauma, and signs of respiratory distress.
2. Inform the patient of what is being done.
3. Place your middle finger flat on the chest in one quadrant.
4. Tap with the middle finger of the other hand.
5. Check the apices anteriorly and posteriorly.
6. Check the bases posteriorly.
7. Compare the pitch at the same level of each lung.
8. Place both thumbs on the xiphoid process.
9. Spread your hands over lower rib cage.
10. Check for equal movement during two respiratory cycles.
11. Place your hands over the total rib cage to check for tenderness and instability over the ribs.
12. Place your fingers on the trachea to check for pendulum action.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Demonstration 2.1.3.S: Auscultation of Lung Sounds*Equipment*

Stethoscope

Student posing as a patient

Procedure

Position a student in front of the class.

Make sure all students can see and hear the demonstration.

Steps

1. Inform the patient of what is to be done.
2. Ask the patient to take slow, deep breaths through his mouth.
3. Place the diaphragm of the stethoscope gently against the thorax in each of the quadrants, anterior and posterior (a total of eight sites).
4. Listen for at least one complete respiratory cycle in each quadrant.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

Practice Session 1

Equipment

- Stethoscope (one for every student)
- Student posing as a patient
- Notebook and pencil (one for every student)

Skills

- 2.1.1.S Assessment through Inspection
- 2.1.2.S Assessment through Percussion
- 2.1.3.S Assessment through Auscultation
- 2.1.4.S Assessment through Palpation

Procedure

Divide the class into groups of three.

Instruct the students to assess a patient suspected of respiratory distress.

- Inspect
- Auscultate
- Percuss
- Palpate

Have the student performing the assessment inform the third student of his findings and record them.

Have the students then switch roles until all students have performed a patient assessment.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluations 2.1.1.S, 2.1.2.S, 2.1.3.S, and 2.1.4.S: Patient Assessment

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Stethoscope (one for each student)

An assistant instructor posing as a patient

Procedure

Set up evaluation stations (the number of instructors will determine the number of stations).

Have the students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation station(s) one at a time.

During evaluation, instruct the assistant instructor to simulate various abnormal respiratory rates and rhythms.

Instruct the students that they should return to the waiting area upon completion of their evaluation and send another student to the station, until all students have been evaluated.

Steps—Inspection

— — — A. Observe for rate and rhythm (the instructor should then ask for the name of the type of breathing being simulated).

— — — B. Name the type of breathing being simulated.

- — — C. Evaluate the patient's speech.
- — — D. Inspect the chest for shape and symmetry.
- — — E. Observe for signs of respiratory distress. (Assistant instructor should cough into a handkerchief.)
- — — F. Observe for products of a cough.

Steps—Percussion

- — — A. Inform the patient of what is being done.
- — — B. Place the middle finger of one hand on the patient's chest.
- — — C. Tap it with the middle finger of the other hand.
- — — D. Check the apices anteriorly and posteriorly.
- — — E. Check the bases posteriorly.
- — — F. Compare the pitch at the same level of each lung.

Steps—Auscultation

- — — A. Inform the patient of what is being done.
- — — B. Ask the patient to take slow, deep breaths through his mouth.
- — — C. Place the diaphragm of the stethoscope gently against the thorax in each of the quadrants, anterior and posterior (a total of eight sites).
- — — D. Listen for at least one complete respiratory cycle in each quadrant.

Steps—Palpation

- ___ ___ ___ A. Inform the patient of what is being done.
- ___ ___ ___ B. Place the thumbs on the xiphoid process and spread the hands over the lower rib cage and observe for equal movement for at least two respiratory cycles.
- ___ ___ ___ C. Palpate the rib cage for tenderness and instability.
- ___ ___ ___ D. Place the fingers on the trachea to check for pendulum action.

NOTES

UNIT 3

emt-p

PATHOPHYSIOLOGY AND MANAGEMENT OF RESPIRATORY PROBLEMS

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

- 3.2.1.K Given a list of medical problems, the student should be able to select those that may cause acute respiratory insufficiency.
- 3.2.2.K Given a list of trauma-related problems, the student should be able to select those that may cause acute respiratory insufficiency.
- 3.2.3.K Given a list of treatment procedures, the student should be able to select the most appropriate ones to be employed in the management of the respiratory arrest patient.

NOTE: Successful completion of this objective requires the student to select all required procedures in the proper sequence as indicated by the instructor.

- 3.3.1.K Given a list of causes of upper airway obstruction, the student should be able to select the cause that occurs most often.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

NOTES

- 3.3.2.K Given a list of symptoms, the student should be able to identify at least two symptoms of upper airway obstruction.
- 3.3.3.K Given a patient with an upper airway obstruction in which hyperextension of the neck does not create a patent airway, the student should be able to list at least three alternate methods of clearing the airway.
- 3.4.1.K Given a list of patient characteristics, the student should be able to recognize the general characteristics of chronic lung disease patients.
- 3.4.2.K Given a list of symptoms, the student should be able to select those symptoms of asthma.
- 3.4.3.K Given a patient with excessive mucous secretion in the tracheobronchial tree, the student should be able to describe the appropriate treatment.
- 3.4.4.K Given a list of pathological conditions of the respiratory system, the student should be able to select those conditions that represent the pathophysiology of emphysema.
- 3.4.5.K Given that the chronic obstructive pulmonary disease (COPD) patient is in respiratory distress, the student should describe what corrective action and precautions must be taken.
- 3.4.6.K Given a list of factors, the student should be able to select those factors that may precipitate an acute asthma attack.
- 3.4.7.K Given that a patient is experiencing an acute asthma attack, the student should be able to list the signs of the attack discovered during patient assessment.
- 3.4.8.K Given a list of treatment procedures, the student should be able to select the most appropriate treatment for a patient experiencing an acute asthma attack.

- 3.5.1.K Given a list of causes, the student should be able to select those causes of respiratory burns.
- 3.5.2.K Given a patient who has inhaled a toxic gas, the student should be able to list at least four items of the patient's history that must be obtained.
- 3.5.3.K Given a list of results of unconsciousness, the student should be able to select the result that most endangers the toxic-inhalant patient.
- 3.5.4.K Given a patient suspected of inhaling a toxic material, the student should be able to list at least three activities of assessment that must be performed.
- 3.5.5.K Given that rhonchi are noted upon assessment, the student should be able to describe the cause(s) of rhonchi.
- 3.5.6.K Given that rales are noted upon assessment, the student should be able to describe the cause(s) of rales.
- 3.5.7.K Given a patient with rapidly developing edema of the larynx and when presented with courses of action, including the number of minutes it will take to arrive at a hospital, the student should be able to select the best course of action under a variety of time constraints.
- 3.5.8.K Given a patient who has inhaled a toxic material, requiring intubation and with gag reflex still intact, the student should be able to describe the course of action to be followed.
- 3.5.9.K Given a patient who has inhaled a toxic material, the student should be able to list the care to be initiated in the field, in addition to airway care.
- 3.6.1.K Given that a patient is a near-drowning victim, the student should be able to list at least seven steps of treatment to be followed. The student must list those

seven steps in their correct sequence in order to complete this objective.

- 3.6.2.K Given that two patients were salt-water and fresh-water near-drowning victims, respectively, the student should be able to describe the physiological differences (if any) in their conditions based on the type of water aspirated, and he should be able to list the differences (if any) in the treatment of the respective patients.
- 3.6.3.K Given that a near-drowning patient has received intermittent positive-pressure ventilation (IPPV) and given a list of results of the IPPV, the student should be able to select the most probable, immediate result and describe any additional treatment that may be necessary.
- 3.6.4.K Given that a near-drowning victim has water in his lungs and given a list of procedures, the student should be able to identify the procedure to be employed at the scene.
- 3.6.5.K Given that a near-drowning patient has experienced laryngospasm and given a list of results, the student should be able to select the result of a laryngospasm in this situation.
- 3.7.1.K Given that a patient is suspected of having pulmonary edema, the student should be able to list the procedure for patient assessment and at least one purpose for each step in the procedure.
- 3.7.2.K Given a list of three sounds (omit wheezing) heard upon auscultation, the student should be able to identify the sound most often heard in the pulmonary edema patient.
- 3.7.3.K Given a list of locations within the lungs, the student should be able to select the most important area to be auscultated in the assessment for pulmonary edema.
- 3.7.4.K Given that a patient is experiencing pulmonary edema, the student should be able to list the appropriate treatment of such a patient in the field and at least one reason for each treatment procedure.

- 3.7.5.K After having successfully completed the previous objective and given a list of positions on extremities, the student should be able to identify the positions in which rotating tourniquets should be placed.
- 3.7.6.K After having successfully applied rotating tourniquets and given a list of directions and time intervals, the student should be able to select time intervals between the rotation of the tourniquets.
- 3.7.7.K Given a list of degrees of tightness and having successfully completed the previous objective, the student should be able to select the degree to which the rotating tourniquets should be tightened.
- 3.8.1.K Given that a patient is hyperventilating and given a list of arterial carbon dioxide tensions, the student should be able to select the likely PCO_2 of such a patient.
- 3.8.2.K Given that a patient is hyperventilating and given a list of causes, the student should be able to select those causes of hyperventilation.
- 3.8.3.K Given a patient with hyperventilation syndrome and a list of treatments, the student should be able to select the most appropriate treatment.
- 3.8.4.K Given that a patient is hypoventilating and given a list of arterial carbon dioxide tensions, the student should be able to select the likely PCO_2 of such a patient.
- 3.8.5.K Given that a patient is hypoventilating and given a list of causes, the student should be able to select those causes of hypoventilation.
- 3.9.1.K Given a list of signs and symptoms, the student should be able to select those signs and symptoms of a patient experiencing a pulmonary embolism.
- 3.9.2.K Given a list of statements describing the sequential physiology of a pulmonary embolism, the student should be able to list those statements in their correct sequence.

3.9.3.K Given a list of procedures, the student should be able to select the procedures to be employed in the management of a patient experiencing a pulmonary embolism.

3.10.1.K Given that a patient has suffered simple rib fractures, the student should be able to describe at least two respiratory problems resulting from the pain of fractured ribs.

3.10.2.K Given that a patient has suffered simple rib fractures, the student should be able to describe patient assessment and treatment procedures.

3.10.3.K Given a list of definitions, the student should be able to recognize the definitions associated with the following labels:

- Flail chest
- Simple pneumothorax
- Tension pneumothorax
- Sucking chest wound
- Hemothorax

3.10.4.K Given a list of symptoms, the student should be able to recognize the symptoms of the following problems:

- Flail chest
- Simple pneumothorax
- Tension pneumothorax
- Sucking chest wound
- Hemothorax

3.10.5.K Given a list of treatment procedures, the student should be able to recognize those procedures to be used in the management of:

- Flail chest
- Simple pneumothorax
- Tension pneumothorax
- Sucking chest wound
- Hemothorax

- 3.10.6.K Given that a patient has a tension pneumothorax and given a list of effects on cardiac output, the student should be able to identify the effect on cardiac output.

Skill Objective

After completing this module, the students should be able to correctly perform the skill objective. "Correctly" will be defined by the instructor. Skill evaluation sheets are included in the module.

- 3.3.1.S Given an adult manikin posing as an unconscious patient, the student should be able to demonstrate the procedure for the removal of a foreign object without the aid of any equipment. Correct performance will include (in the proper sequence):

- Check for unresponsiveness
- Check for breathing
- Attempt to breathe
- Reposition head and attempt to ventilate
- Four sharp blows to back
- Abdominal or chest thrust (4)
- Manual clearing of the mouth
- Attempt to breathe

Instructor Activities

Assign the material referred to below during the class period immediately before beginning this unit:

- Chapter 5, Unit 3, of the *Text*
- Knowledge objectives for this unit

Prepare a lecture including any audiovisual support materials specified in the content outline on page V-37. Following are suggested instructional techniques:

- 3.1: Write the general unit topics on the chalkboard and leave them there during the entire unit.

- 3.3: Ask the students to describe the most common source of upper airway obstruction and how they would manage it.
- 3.4C3: Ask the students what must be done in the emergency care of a COPD patient and what may happen as a result.
- 3.5A: Ask the students to list some causes of toxic inhalation.
- 3.6: Ask the students to describe the initial survey and treatment required of the near-drowning victim.
- 3.6E: Ask the students to list the advanced-life-support tasks that should be performed at this time.
- 3.10A2: Ask the students to describe the possible results of rib fractures and the treatment to be given.
- 3.10B1: Ask the students for the result of the paradoxical movement of the chest wall.
- 3.10B3: Ask the students how to treat and transport a flail chest patient.
- 3.10C: Ask the students to list the types of pneumothorax that occur, a description, and the treatment of each.
- In summarizing the lesson, briefly discuss the topics listed by asking the students to summarize individual units. Ask for questions and have other students answer them.

Evaluate the students' abilities to perform the objectives. The evaluation can be done upon completion of the unit or at the end of the module. The objectives should be used as a guide to develop the evaluation.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk
Adult manikin
Infant manikin

Equipment—Medical

None

Materials

Knowledge objectives (optional)

Written examinations
Answer sheets and pencils
Text

Content Outline

3.1. Introduction (write the general topics on the chalkboard)

- A. Respiratory depression
- B. Upper airway obstruction
- C. Obstructive airway disease
 - 1. Asthma
 - 2. COPD
- D. Toxic inhalations
- E. Near drowning
- F. Pulmonary edema
- G. Hyperventilation syndrome
- H. Pulmonary embolism
- I. Thoracic trauma

3.2. Respiratory depression and respiratory arrest

- A. Acute respiratory failure
 - 1. Define it as a state where normal ventilatory activity cannot be accomplished.
 - 2. Point out that the causes are either medical or trauma related.
 - a. Central nervous system (CNS) dysfunction
 - (1) Brain
 - (2) Spinal cord
 - b. Muscular weakness
 - c. Airways
 - d. Alveoli
- B. Acute respiratory failure
 - 1. Specific information concerning critical blood gas levels is not available in the field.
 - 2. Clinical signs must be used to assess respiratory sufficiency in the field.
 - 3. Respiratory arrest may occur as a result of the medical and trauma-related causes previously described.
 - 4. Management is essential.

NOTES

- a. Establish a patent airway.
- b. Determine the presence or absence of adequate respiration.
- c. If absent or very slow and shallow, assist ventilations.
- d. Administer high-concentration oxygen with IPPV.
- e. Determine if the patient's heart is providing effective circulation and perform external cardiac compression, if required.
- f. Secure an airway with an endotracheal tube if normal protective reflexes are not present.
- g. Establish an intravenous lifeline.

3.3. Upper airway obstruction (ask the students for the most common source)

A. Point out that the tongue is the most common source of obstruction.

1. Gurgling or stertorous respirations are present.
2. The head tilt or triple airway maneuver usually relieves this obstruction.
3. An oropharyngeal or nasopharyngeal airway may be helpful in comatose patients.

B. Discuss foreign bodies (e.g., "cafe coronary")

1. Common problem
2. Typical patient
 - a. Middle-aged or elderly
 - b. Denture wearer
 - c. Slightly inebriated
 - d. Is eating something
3. Signs/symptoms
 - a. Victim is aphonic.
 - b. Victim may stagger about.
 - c. Victim becomes cyanotic.
4. Management
 - a. Situation: Conscious victim—procedure
 - (1) Encourage the victim to cough.
 - (2) Deliver blows to the back (4).
 - (a) Position the patient, head down.
 - (b) Deliver four blows between the shoulder blades with the palm of the hand.

- (3) Apply abdominal thrust—"Heimlich maneuver."
 - (a) Stand behind the victim, with both arms around him between the xyphoid process and the umbilicus.
 - (b) Allow the victim's head and arms to fall forward.
 - (c) Make a fist with thumb extended downward.
 - (d) Cover fist with other hand, administer quick thrusts (4 times) in an upward and downward trajectory.
 - (e) Remember this maneuver is not as effective as a cough.
- (4) If ineffective, repeat sequence.

NOTE: When abdominal thrust is contraindicated, alternative method of chest thrust is to use the same steps as the abdominal thrust except hand position is located on the victim's lower sternum, clear of the xyphoid. Trajectory of thrust is inward only. Rapid increase in intrathoracic pressure is gained by rapidly reducing the thoracic cage.

- b. Situation: Unconscious victim—procedure
 - (1) Check for unresponsiveness.
 - (2) Check for breathing.
 - (3) Attempt to ventilate.
 - (4) Reposition head and attempt to ventilate.
 - (5) Deliver blows to the back.
 - (a) Roll the victim over, slap him on the back.
 - (6) Administer abdominal thrust.
 - (a) Make sure the patient is on his back.
 - (b) Straddle or position alongside of the patient.
 - (c) Press both hands, one on top of the other, between the xyphoid process and the umbilicus in an upward and inward trajectory.
 - (d) Attempt ventilation, as above, or use alternative method of chest thrust by positioning

hand in mid thorax with heel of hand near patient's nipples and thumb extended upwards. Thrust is delivered anteriorly to posteriorly and laterally to medially in an inward motion.

- (7) Clear airway manually, if possible, as previously described.
- (8) Attempt ventilation.
 - (a) If successful, check pulse and continue basic life support.
 - (b) If not, continue steps 5-7.
- c. Infant—procedure
 - (1) Clear the mouth manually.
 - (2) Turn the infant over, slap on the back.
- d. Demonstration 3.3.1.S
- 5. If equipment is available
 - a. Should be done first.
 - b. Perform direct laryngoscopy
 - c. Remove object with Magill forceps
- 6. Late stages of asphyxiation
 - a. Muscular rigidity sets in.
 - b. Jaws may be clenched shut.
 - c. Conventional maneuvers may not be successful.
 - d. Cricothyroidotomy may be the only method of ventilation.

3.4. Obstructive airway disease

A. General characteristics

- 1. Increased resistance to air flow
- 2. Often barrel-chested in appearance
- 3. Large lungs with decreased capacity
- 4. Low diaphragm

B. Asthma

- 1. Point out that there is increased reactivity of the trachea, bronchi, and bronchioles to various stimuli.
- 2. Discuss narrowing of the airways (bronchospasm).
- 3. Discuss swelling of mucous membranes in the bronchial walls.
- 4. Point out that thick mucous secretions block the bronchi.

5. Point out that an acute attack may be precipitated by:
 - a. Allergic reaction
 - b. Respiratory infection
 - c. Emotional stress
 6. Point out that the chest is hyperresonant to percussion due to air trapped in the lungs.
 7. Discuss management (ask the students for procedures).
 - a. Determine what drugs have been taken already while performing the following procedures:
 - (1) Establish an airway
 - (2) Administer *humidified* oxygen
 - (3) Establish an intravenous lifeline
 - (4) Administer bronchodilators
 - (5) Check for hydration
 - (6) Monitor
- C. Chronic obstructive pulmonary disease (COPD)
1. Emphysema
 - a. Permanent, abnormal enlargement of any part of the acinus, accompanied by destructive changes
 - b. Constriction of the bronchi upon expiration
 - c. Overstretching of the alveolar sacs
 - d. Loss of lung elasticity
 - e. Lungs are chronically overfilled
 - f. Body cells are not supplied with adequate oxygen
 - g. Increased dyspnea upon exertion
 2. Chronic bronchitis
 - a. Excessive mucus production in the tracheobronchial tree
 - b. Mucus gland enlargement
 - c. Narrowed peripheral airways
 - d. Decreased ciliary activity
 - e. Hypercarbia
 - f. Hypoxemia
 3. Management
 - a. Point out that patient is functioning on below normal PO_2 and an elevated PCO_2 .
 - b. Point out that a patent airway must be established.
 - c. Point out that hypoxic drive stimulates respiratory activity.
 - d. Ask the students what should be done and what may result from the administration of oxygen.

- e. Discuss procedures to be followed next:
 - (1) Position the patient in a comfortable position (usually sitting or semisitting).
 - (2) Administer oxygen.
 - (3) Monitor the respiratory rate and depth, and be prepared to assist.
 - (4) Establish an intravenous lifeline.
 - (5) Administer aminophylline, if ordered.
 - (6) Encourage the patient to cough up secretions.

3.5. Toxic inhalations and aspirations

- A. Causes (ask the students to list some causes)
 - 1. Toxic products of combustion (e.g., carbon monoxide)
 - 2. Natural gas
 - 3. Propane gas
 - 4. Superheated air
 - 5. Gasoline
 - 6. Chlorine gas
- B. Patient history (accuracy is essential)
 - 1. Determine the nature of the inhalant or combusted material.
 - 2. Determine the duration of exposure.
 - 3. Determine the nature of the environment in which exposure occurred (e.g., outdoors or indoors).
 - 4. Determine if there was ever a loss of consciousness (indicating loss of lower airway protective measures).
- C. Physical assessment
 - 1. Inspect the face and mouth for external burns.
 - 2. Visualize the throat.
 - 3. Auscultate the chest for rales or wheezes.
- D. Airway maintenance (the key to emergency treatment—ask students why)
 - 1. Edema may develop rapidly in the upper airway, necessitating a tracheostomy or cricothyroidotomy.
 - 2. Chemical burns of the lower respiratory tract damage the bronchial epithelium, producing:
 - a. Pulmonary edema
 - b. Wheezing
 - 3. Early endotracheal intubation may be required.
 - a. Gag reflex is still intact with conscious patients.
 - b. Intubation may still need to be performed.

4. Oxygen should be administered to all patients with inhalation injuries.
5. An intravenous lifeline should be initiated.

3.6. Near drowning (ask the students to describe the initial survey and treatment required)

- A. Perform artificial ventilation as soon as possible (i.e., in the water).
 1. Do not waste time trying to remove water from lungs; they are protected by the laryngospasm.
 2. Remember that in fresh water, the hypotonic solution has been absorbed through the lungs.
 3. Remember that in salt water, pulmonary edema happens if aspiration occurs.
- B. When the patient has been removed from the water, conduct a primary survey and begin chest compressions, if indicated.
- C. Perform early endotracheal intubation to prevent aspiration.
 1. An IPPV without an endotracheal tube usually results in regurgitation in this situation
- D. Insert a nasogastric tube to decompress the stomach, but only after an endotracheal tube is in place.
- E. Conduct other advanced-life-support activities as in other cardiac arrest situations. (Ask the students to list treatment steps.)
 1. Initiating an intravenous line
 2. Bicarbonate administration
 3. Cardiac monitoring
 4. Defibrillation
- F. Remember that drowning victims tend to develop severe metabolic acidosis.
 1. Administration of more bicarbonate than in other arrest situations is often indicated.
 2. If the distance from a hospital is great, large doses of steroids may be ordered by the physician.

3.7. Pulmonary edema

- A. Discuss factors producing pulmonary edema.
 1. Left heart failure
 2. Aspiration of irritant substances

3. Inhalation of toxic fumes
4. Near drowning
5. Heroin overdose
- B. Point out that fluid accumulates in the lungs.
- C. Point out that oxygen is hindered in moving from the alveoli into the blood.
- D. Discuss vital signs. (Ask students for clinical signs.)
 1. Hypoxia, dyspnea, and cyanosis may be present
 2. Tachycardia
 3. Possible distended neck veins
 4. Patient laboring to breathe, often sitting bolt upright
- E. Discuss auscultation.
 1. Rales are usually heard there first.
 2. Listen to the posterior bases of both lungs.
- F. Discuss management.
 1. Manage and transport the patient in a sitting position (with feet dangling, if possible).
 2. Give oxygen (highest concentration possible).
 3. Perform an IPPV.
 4. Establish an intravenous lifeline.
 5. Monitor.
 6. Administer morphine, if ordered.
 7. Apply rotating tourniquets, if indicated.
 - a. Apply high on extremities
 - b. Tighten until extremity pulses are barely palpable
 - c. Rotate every 5 to 10 minutes

3.8. Hyperventilation syndrome

- A. Point out that it results in an increase in the elimination of CO_2 in excess of the body's CO_2 production.
 1. Decreased PCO_2 is present.
 2. Patients experiencing anxiety often hyperventilate.
 3. Patients may complain of fatigue, nervousness, or dizziness.
 4. Patients often have a sensation of tingling or numbness.
 - a. Around the mouth
 - b. In hands and feet
 5. Tachypnea and sometimes hyperpnea are present.
 6. Carpopedal spasm is present.
 7. Patients are predisposed to seizures.

B. Discuss management.

1. Attempt to calm the patient.
2. Have the patient breathe into a paper bag.
 - a. Rebreathes CO_2
 - b. Helps restore PCO_2 to normal

3.9. Pulmonary embolism**A. Define.****B. Discuss the sources.**

1. Air
2. Large fatty particles from a bone fracture
3. Blood clot
4. Amniotic fluid

C. Describe the physiology of a pulmonary embolism.

1. Pulmonary circulation is blocked
2. Right heart pumps against increased resistance
3. Pulmonary capillary pressure increases
4. Shunting

D. Point out that patient assessment may include:

1. Dyspnea, tachypnea
2. Weak, rapid pulse; often hypotension
3. Cyanosis
4. Rubbing sound on auscultation

E. Discuss management.

1. Administer oxygen in the highest possible concentration.
2. Administer fluids as an intravenous lifeline.
3. Monitor.

3.10. Chest trauma**A. Rib fracture**

1. Point out that 75 percent of those who die as a result of automobile accidents have suffered chest injuries.
2. Point out that simple rib fractures usually involve the fourth, fifth, sixth, and seventh ribs. (Ask the students for possible results and treatment.)
 - a. Rib fractures are usually very painful.
 - b. They restrict respiratory activity:
 - (1) Adequate respirations are prevented

- (2) Progressive atelectasis may ensue
- c. Patient should be encouraged to take deep breaths.
- d. Oxygen should be administered.
- e. The painful area may be splinted with a pillow.
- B. Flail chest—multiple rib fractures in the same plane or involving the sternum
 - 1. Point out that the unsupported chest wall moves paradoxically, (Ask the students for results.)
 - a. Bulges out during expiration
 - b. Collapses during inspiration
 - (1) Possibly contusing the lung beneath
 - (2) Resulting in impaired oxygenation
 - 2. Point out that oxygen must be administered.
 - 3. Discuss transportation. (ask the students how)
 - a. Stabilize the flail segment with manual pressure, sandbags, or patient positioning.
 - b. Continue respiratory care.
- C. Traumatic pneumothorax (Ask the students for types, description, and treatment of all three types.)
 - 1. Simple pneumothorax
 - a. Point out that it is often caused by blunt trauma—a fractured rib tears the lung.
 - b. Discuss the loss of negativity of intrapleural pressure.
 - c. Point out that a small pneumothorax (less than 10 percent) may absorb slowly—large ones may require thoracostomy.
 - d. Point out that subcutaneous emphysema may be present.
 - e. Point out that frequent auscultation and close observation are indicated.
 - 2. Tension pneumothorax
 - a. Air escapes into the pleural cavity.
 - b. The lung collapses and the mediastinum shifts to the opposite side.
 - c. Upon expiration, intrapleural pressure rises and the valvelike opening through which air entered the pleural cavity closes.
 - d. Mediastinal shift is augmented with every respiration.
 - e. Venous return is compromised due to increases in

intrathoracic pressure and distortion of the venae cavae.

f. Tension must be relieved.

(1) Use an over-the-needle 14-gage venous catheterization set and flutter valve.

(2) Remove air in increments to avoid mediastinal flutter.

(3) Insert in the second or third intercostal space in the midclavicular line.

3. Sucking chest wound

a. Point out that it is caused by a puncture of the chest wall (e.g., from a bullet, knife, or turn signal lever).

b. Point out that it produces the free exchange of air between the pleural cavity and the outside atmosphere.

c. Point out that mediastinal flutter occurs.

d. Point out that cardiac output is severely reduced.

e. Point out that the hole must be sealed with an occlusive pressure dressing.

f. Point out that such wounds are converted to closed pneumothorax and may move to tension pneumothorax.

g. Point out that the treatment for this and other chest injuries involves high-concentration oxygen administration by mask.

D. Hemothorax

1. Point out that it is a collection of blood in the pleural cavity.

2. Point out that large amounts of blood may produce mediastinal displacement, which may affect cardiac output.

3. Point out that a chest tube for drainage must be inserted in the emergency department.

4. Discuss the necessity to transport quickly.

E. Cardiac tamponade

1. It occurs most frequently after penetrating wounds of the heart.

2. There is accumulation of blood or fluid in the pericardial sac.

3. Intrapericardial pressure increases, and heart pumping action is hindered.

4. Arterial blood pressure gradually falls.
5. Central venous pressure (CVP) rises, and the neck and arm veins distend.
6. There are muffled heart sounds.
7. Pericardiocentesis will eventually need to be performed.

Summary

- Respiratory depression
- Upper airway obstruction
- Obstructive airway disease

- Asthma
- COPD

- Toxic inhalations
- Near drowning
- Pulmonary edema
- Hyperventilation syndrome
- Pulmonary embolism
- Thoracic trauma

NOTES

Demonstration 3.3.1.S: Removal of a Foreign Object***Equipment***

Adult manikin

Infant manikin

Procedure

Position equipment in front of the class so it is easily accessible.

Use a student as a patient and position him in front of the class.

As the skill is demonstrated, describe what is being done. Detailed instruction should be provided, including:

- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps—Unconscious Adult

1. Make sure the head is tilted.
2. Attempt to ventilate.
3. Perform blows to the back—describe:
 - a. Position of the patient
 - b. Location and procedure for blows
4. Sweep out the victim's mouth.
5. Attempt to ventilate.
6. Perform abdominal compressions—describe:
 - a. Position of the patient
 - b. Hand position
 - c. Purpose of thrust
7. Check for an object.
8. Attempt to ventilate.
9. Sweep out the mouth—emphasize:
 - a. Cross-finger maneuver to open the mouth
 - b. Procedure for sweeping out the mouth
10. Attempt ventilation—describe what to do if ventilation is adequate.
11. Demonstrate the difference in procedure when the patient is conscious and upright.

Steps—Infant

1. Sweep out the mouth.
2. Attempt ventilation.
3. Perform blows to the back—describe:
 - a. Position of the patient
 - b. Location and procedure for blows

NOTES

Practice Session 1

Equipment

Adult manikin

Infant manikin

Skills

3.3.1.S Removal of a Foreign Object

Procedure

Because this is a short practice session, include this segment in a practice session held during the presentation of Unit 4.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 3.3.1.S: Removal of a Foreign Object

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Adult manikin

Infant manikin

Procedure

Set up evaluation stations with one set of equipment at each (the number of instructors will determine the number of stations).

Have the students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation station individually.

Instruct the students that as they complete their evaluation, they should return to the waiting area to send another student to the station.

Steps—Adult Manikin

___ ___ ___ A. Tilt the head back.

___ ___ ___ B. Attempt ventilation (assume there are still obstacles).

___ ___ ___ C. Apply four blows to the back, and check the mouth.

- — — D. Attempt ventilation (assume there are still obstacles).
- — — E. Perform four abdominal compressions, and check the mouth.
- — — F. Attempt ventilation (assume there are still obstacles).
- — — G. Sweep out the mouth.

Steps—Infant Manikin

- — — A. Sweep out the mouth.
- — — B. Attempt ventilation.
- — — C. Apply four blows to the back.
- — — D. Attempt ventilation.

UNIT 4

emt-p

TECHNIQUES OF MANAGEMENT

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

- 4.1.1.K Given a list of oxygen-delivery adjuncts, the student should be able to list the percentages of oxygen that can be delivered by each method.
- 4.1.2.K Given a list of oxygen-delivery methods, advantages, and disadvantages, the student should be able to match the advantages and disadvantages with the method of delivery.
- 4.1.3.K Given specific patient situations and illnesses, the student should be able to select the best method of oxygen delivery under those guidelines.
- 4.1.4.K Given that complications may result as a function of oxygen administration, the student should be able to list at least four complications.
- 4.2.1.K Given a list of airway adjuncts, advantages, and disadvantages, the student should be able to match the airway adjuncts with the advantages and disadvantages.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

NOTES

- 4.2.2.K Given a list of characteristics, the student should be able to list the adjunct having those characteristics.
- 4.2.3.K Given a diagram of a bag-valve-mask unit, the student should be able to label and identify the function of all component and attached parts.
- 4.2.4.K Given a list of errors, the student should be able to identify the common errors in using each adjunct.
- 4.2.5.K Given the following list of conditions, the student should be able to list the oxygen concentration delivered to the patient with the bag-valve-mask unit.
- With reservoir tube and oxygen supplementation
 - With oxygen supplementation but without reservoir tubing
 - Without oxygen supplement and without reservoir tubing
- 4.2.6.K Given a list of results, the student should be able to recognize the results that occur when an oropharyngeal airway is used on a conscious or semiconscious adult.
- 4.3.1.K Given a list of advantages, the student should be able to select the advantages of using a demand-valve unit for IPPV.
- 4.3.2.K Given a list of disadvantages, the student should be able to select the disadvantages of using a demand-valve unit for IPPV.
- 4.3.3.K Given a diagram of the demand-valve unit and oxygen system, the student should be able to label and describe the function of all parts.
- 4.3.4.K Given a list of oxygen concentrations, the student should be able to select the highest and lowest concentrations that can be delivered using the demand-valve unit.

- 4.4.1.K Given a list of statements, the student should be able to identify the statement that best describes the purpose of suctioning a patient.
- 4.4.2.K Given a diagram of a piston-powered suction unit, the student should be able to label and describe the operation and cleaning of each component and attached part.
- 4.4.3.K Given that there are various types of suction units, the student should be able to list at least four different types of units determined by the method in which suction effect is obtained.
- 4.4.4.K Given that there are various types of suction catheters, the student should be able to list at least three different types, determined by difference in use and material composition.
- 4.4.5.K Given a list of situations describing patients who require suctioning, the student should indicate which type of catheter should be used.
- 4.4.6.K Given that a patient needs suctioning and already has an endotracheal tube in place, the student should be able to describe the difference between endotracheal suctioning and oropharyngeal suctioning including:
- Dangers
 - Precautions
- 4.5.1.K Given a list of statements, the student should be able to identify the statement that best describes the purpose of nebulization.
- 4.5.2.K Given a diagram of a bulb-powered and a hand-powered nebulizer, the student should be able to label the component parts of each and describe the differences in their respective use and function.
- 4.6.1.K Given a list of statements, the student should be able to identify the statement that best describes the purpose of direct laryngoscopy.

- 4.6.2.K Given a diagram of a laryngoscope, the student should be able to label and describe the function and cleaning of all component and attached parts.
- 4.6.3.K Given a list of situations describing patients' conditions, the student should be able to identify the situation(s) that indicate the need for direct laryngoscopy.
- 4.6.4.K Given that there are two basic types of blades, the student should be able to describe both types and list the criteria for blade selection.
- 4.6.5.K Given a list of procedures for insertion of the laryngoscope blade, the student should be able to select the best procedure.
- 4.6.6.K Given a list of errors, the student should be able to identify common errors involved in direct laryngoscopy.
- 4.6.7.K Given a list of equipment and materials, the student should be able to select the items that must be available before direct laryngoscopy is begun.
- 4.7.1.K Given a list of statements, the student should be able to identify the statement that best describes the purpose of endotracheal intubation.
- 4.7.2.K Given a list of situations describing patients with airway maintenance problems, the student should be able to select those situations in which endotracheal intubation is indicated.
- 4.7.3.K Given a list of equipment, materials, and medication, the student should be able to select those items that must be available before intubation is begun.
- 4.7.4.K Given a list of errors, the student should be able to identify common errors involved in endotracheal intubation.
- 4.7.5.K Given a diagram of an endotracheal tube, the student should be able to label and describe the function of all component parts.

- 4.7.6.K Given that a patient requires endotracheal intubation, the student should be able to list the correct procedure to be followed, including all steps in the proper sequence.
- 4.7.7.K Given a list of time intervals, the student should be able to identify the maximum time interval usually available to start and complete the endotracheal intubation procedure.
- 4.7.8.K Given a list of advantages, the student should be able to identify the advantages of endotracheal intubation over other cannulating and noncannulating methods of airway control.
- 4.7.9.K Given a list of disadvantages, the student should be able to identify the disadvantages of endotracheal intubation over other cannulating and noncannulating methods of airway control.
- 4.7.10.K Given a list of respiratory structures, the student should be able to identify those structures that must be visualized and in what order, prior to the insertion of the endotracheal tube.
- 4.8.1.K* Given a list of statements, the student should be able to identify the statement that best describes the purpose of using the esophageal obturator airway.
- 4.8.2.K* Given a list of situations describing patients with airway maintenance problems or potential airway maintenance problems, the student should be able to identify the situation(s) in which the use of the esophageal obturator airway is indicated and contraindicated.
- 4.8.3.K* Given a list of situations, the student should be able to identify those situations in which the esophageal airway may be removed.
- 4.8.4.K* Given a list of advantages, the student should be able to identify the advantages of using the esophageal obturator

*Indicates optional skill.

airway over other cannulating and noncannulating methods of airway control.

- 4.8.5.K* Given a list of disadvantages, the student should be able to identify the disadvantages of using the esophageal obturator airway over other cannulating and noncannulating methods of airway control.
- 4.8.6.K* Given a diagram of the esophageal obturator airway, the student should be able to label and describe the function of all component parts.
- 4.8.7.K* Given a list of equipment and materials, the student should be able to identify those items that must be available before esophageal obturation is begun.
- 4.8.8.K* Given that a patient requires an esophageal obturator airway, the student should be able to list the procedure for insertion of the esophageal airway, including all steps in the proper sequence.
- 4.8.9.K* Given a list of errors, the student should be able to identify common errors involved in the use of the esophageal obturator airway.
- 4.9.1.K* Given a list of statements, the student should be able to identify the statement that best describes the purpose of thoracic decompression.
- 4.9.2.K* Given a list of equipment and materials, the student should be able to identify those items that must be available before thoracic decompression can be performed.
- 4.9.3.K* Given a list of thoracic locations, the student should be able to identify the location at which decompression should be performed.

*Indicates optional skill.

- 4.9.4.K* Given a list of situations describing patients' conditions, the students should be able to identify those situations in which thoracic decompression should be performed.
- 4.9.5.K* Given a list of errors, the student should be able to identify common errors involved in thoracic decompression using a venous catheterization set and a Heimlich valve.
- 4.9.6.K* Given that a patient requires thoracic decompression, the student should be able to state the correct procedure using a venous catheterization set and a flutter valve, including all steps in their proper sequence.
- 4.9.7.K* Given a list of various sizes of venous catheterization sets, the student should be able to identify the proper size set to be used for thoracic decompression.
- 4.10.1.K* Given a list of respiratory problems, the student should be able to select those problems in which the use of a PEEP device is indicated.
- 4.10.2.K* Given a list of statements describing the function of a PEEP device, the student should be able to select the statement that best describes the function of such a device.
- 4.10.3.K* Given a list of procedures, the student should be able to select the procedures to be used, in their correct sequence, in the application and use of a PEEP device.
- 4.11.1.K* Given a list of statements, the student should be able to identify the statement that best describes the purpose of cricothyroidotomy.
- 4.11.2.K* Given a list of anatomical locations, the student should be able to identify the location for the performance of a cricothyroidotomy.

*Indicates optional skill.

- 4.11.3.K* Given a list of statements, the student should be able to identify the statement that best describes the method of finding the anatomical location for the performance of a cricothyroidotomy.
- 4.11.4.K* Given a diagram of a cricothyrotome, the student should be able to label and describe the function of all component parts.
- 4.11.5.K* Given a list of situations describing patients with airway maintenance problems, the student should be able to identify those situations in which a cricothyroidotomy should be performed.
- 4.11.6.K* Given a list of advantages, the student should be able to identify those advantages of cricothyroidotomy over other cannulating and noncannulating methods of airway control.
- 4.11.7.K* Given a list of disadvantages, the student should be able to identify those disadvantages of cricothyroidotomy over other cannulating and noncannulating methods of airway control.
- 4.11.8.K* Given a list of errors, the student should be able to identify those common errors involved in the performance of a cricothyroidotomy.
- 4.11.9.K* Given that a patient requires a cricothyroidotomy, the student should be able to state the correct procedure for performing a cricothyroidotomy, including all steps in their proper sequence.
- 4.11.10.K* Given that a patient requires a cricothyroidotomy and a cricothyrotome is not available, the student should be able to list the steps to be performed in their proper sequence and the alternate equipment and materials required.
- 4.12.1.K* Given a list of statements, the student should be able to select the statement that best describes the purpose of transtracheal jet insufflation.

*Indicates optional skill.

4.12.2.K* Given a list of statements describing patient situations, the student should be able to select the statement that best describes the situation in which transtracheal jet insufflation should be performed.

4.12.3.K* Given a list of procedures, the student should be able to select the procedures, in their proper sequence, to be followed in the performance of transtracheal jet insufflation.

Skill Objectives

After completing this module, the student should be able to correctly perform each of the skill objectives. "Correctly" will be defined by the instructor. Skill evaluation sheets are included in the module.

4.1.1.S Given a fellow student as a patient, the student should be able to demonstrate the procedure for the preparation of the oxygen system and the administration of oxygen to a breathing patient using:

- Nasal cannula
- Partial rebreathing mask
- Venturi mask
- Demand-valve unit

4.2.1.S Given an adult manikin, oropharyngeal and nasopharyngeal airways, pocket mask, oxygen cylinder, and bag-valve mask, the student should be able to demonstrate the procedure for administering intermittent positive-pressure ventilation using:

- Pocket mask
- Bag-valve mask and oropharyngeal airway
- Bag-valve mask with oxygen
- Nasopharyngeal airway with bag-valve mask

4.2.2.S Given a bag-valve mask, the student should be able to demonstrate the assembly, disassembly, and cleaning of the bag-valve-mask unit.

*Indicates optional skill.

- 4.3.1.S Given an adult manikin, an oropharyngeal airway, and a demand-valve unit, the student should be able to demonstrate the procedure for performing intermittent positive-pressure ventilation.
- 4.3.2.S Given a demand-valve unit, the student should be able to demonstrate the assembly, disassembly, and cleaning of the unit.
- 4.4.1.S Given a piston-powered suction unit, a selection of sterile catheters, a container of sterile water, sterile gloves, and an adult intubation manikin with an endotracheal tube in place, the student should be able to demonstrate aseptic and atraumatic nasopharyngeal and endotracheal suctioning techniques.
- 4.5.1.S Given a fellow student as a patient, the student should be able to demonstrate the use of hand-powered or gas-powered nebulizers.
- 4.6.1.S Given an adult or infant intubation manikin, laryngoscope, assorted curved and straight blades, and Magill forceps, the student should be able to demonstrate the technique of direct laryngoscopy for removal of a foreign body.
- 4.7.1.S Given an adult or infant intubation manikin, laryngoscope, assorted curved and straight blades, endotracheal tube set, water-soluble lubrication jelly, syringe, hemostat, bag-valve unit, and tape, the student should be able to demonstrate the technique for the insertion of an endotracheal tube within 30 seconds.
- 4.8.1.S* Given an adult intubation manikin, an esophageal obturator airway, 30-cc syringe, and bag-valve unit, the student should be able to demonstrate the technique for the insertion of an esophageal obturator airway. He should further be able to demonstrate endotracheal intubation with the esophageal obturator in place and subsequent correct removal of the obturator.

*Indicates optional skill.

- 4.9.1.S* Given a prepared animal or cadaver, a 12- to 14-gage venous catheterization set, and a Heimlich valve, the student should be able to demonstrate the technique for chest decompression.
- 4.10.1.S* Given a fellow student as a patient with a positive-end expiratory pressure (PEEP) device, the student should be able to demonstrate the technique for using this device.
- 4.11.1.S* Given an animal or cadaver with an obstructed upper airway, and a cricothyrotome, the student should be able to demonstrate the procedure for performing a cricothyroidotomy.
- 4.12.1.S* Given an animal or cadaver with an obstructed upper airway, a 10-gage venous catheterization set, an oxygen source, a demand valve, and connecting tubing, the student should be able to demonstrate the technique of transtracheal jet insufflation.

Instructor Activities

Assign the material referred to below during the class period immediately before beginning the unit:

- Chapter 5, Unit 4, of the *Text*
- Skill and knowledge objectives for this unit

Prepare a lecture, providing any audiovisual support materials that are specified in the content outline on page V-68. Following are some suggested instructional techniques:

- Introduction: List the topics on the chalkboard and leave them there during the entire unit. Only list the topics selected for use in the program.
- 4.1B: Write all methods of oxygen administration and their respective liter flows on the chalkboard. Throughout the section, ask the students to discuss the advantages and disadvantages of each method.
- 4.2B5: Ask the students to list uses of the oropharyngeal airway.

*Indicates optional skill.

- 4.2D4: Ask the students to list advantages over other similar devices.
- 4.2E9: Ask the students which type of bag-valve-mask unit they prefer and discuss the advantages and disadvantages.
- 4.3D: Ask the students for the advantages of the demand-valve unit.
- 4.3E: Ask the students for the disadvantages of the demand-valve unit.
- 8H: Ask the students for the advantages of the esophageal obturator airway.
- 4.8I: Ask the students for the disadvantages of the esophageal obturator airway.
- 4.9: Note that this subunit may be taught in the laboratory setting and the skills may be demonstrated during the same session.
- 4.9G: Discuss what makes this technique difficult to perform.
- 4.11: Note that this subunit may be taught in the laboratory setting and the skills may be demonstrated during the same session.
- 4.11G: Ask students how many times they have seen the need for the performance of this technique in their field experience. Ask them to describe the surrounding circumstances.

Evaluate Skill Objectives 1.1.S through 4.5.1.S before any further skill evaluations take place. The students' ability to successfully demonstrate these skills will facilitate the instruction of the other skills in this unit. The nature of most skill evaluations in this module indicates that evaluation sessions may be time consuming; therefore, several different skill evaluation sessions should be scheduled to insure adequate skill evaluation time. The written knowledge evaluation may be separated as the skill evaluations are separated. The number of optional skills and knowledge objectives in this unit requires flexibility in evaluation as well as presentation of unit content.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

One for every three to four students:

Adult manikin
Adult intubation manikin
Infant intubation manikin
Oxygen cylinder
Regulator
Oxygen flow meter
Bubble humidifier with sterile water
Demand-valve unit
Oropharyngeal airway, set
Nasopharyngeal airway, set
Pocket mask
Bag-valve mask with reservoir tubing
Hand-powered nebulizer
Gas-powered nebulizer
Laryngoscope with assorted blades
Endotracheal tube, set
10-cc syringe
Piston-powered suction unit
Hemostat

One for each student:

Sterile suction catheters
Sterile gloves
Stethoscope
Nasal cannula
Partial rebreather mask
Venturi mask

One of each:

Water-soluble lubricating jelly, box
Surgical sponges, box
Tape, box

Optional Skill Equipment

One for every three to four students:

Esophageal obturator airway
PEEP device

NOTES

Cricothyrotome and tracheostomy tube with ties
30-cc syringe
Intubation equipment

One for each student:

12- to 14-gage over-the-needle venous catheterization set
Heimlich valve or rubber gloves, scissors, rubber bands
10-gage venous catheterization set

One for every four students:

O₂ tank
Reduction valve to deliver 100 psi means of regulation flow on-off
Ties to secure catheter
Adapters to fit O₂ source to needle hub

Materials

Skill objectives (optional)
Knowledge objectives (optional)
Skill evaluation sheets
Written examination
Answer sheets and pencils
Text

Content Outline

Introduction

- A variety of respiratory problems have been presented in previous units.
- This unit discusses methods of management, including (write on chalkboard):
 - Oxygen administration—management of the obstructed airway (new sequence)
 - Use of adjuncts
 - Use of demand valve
 - Suctioning
 - Use of nebulizers
 - Direct laryngoscopy

- Endotracheal intubation
- Esophageal obturator airway*
- Chest decompression*
- Use of PEEP devices*
- Cricothyroidotomy*
- Transtracheal jet insufflation*

- All skills mentioned will be demonstrated, practiced, and evaluated before the conclusion of this unit.

4.1. Oxygen administration

- A. Primary indication—suspected hypoxia or respiratory distress
- B. Methods of administration (Write all methods and liter flows on the chalkboard.)

1. Nasal cannulas

- a. At 4–6 liters per minute (l/min) O_2 concentration = 30–40 percent
- b. Advantages: inexpensive, disposable, easy to apply, and comfortable for the patient
- c. Disadvantages (occur mostly in long-term use): soreness at external nares, high flow rates cause pain in the frontal sinuses, nasopharyngeal irritation, and they cannot deliver high O_2 concentration

2. Disposable face masks

- a. At 6–12 l/min O_2 concentration = 35–65 percent
- b. Advantages: simple and convenient
- c. Disadvantages: restrictive to the patient

3. Nonrebreathing masks equipped with reservoir bags

- a. At a flow rate that prevents bag collapse upon inspiration, O_2 concentration up to 100 percent
- b. Advantages: high concentration can be delivered, the patient does not inhale any expired gases
- c. Disadvantages: restrictive to patient and the mask fit must be airtight

4. Venturi masks

- a. Point out that masks are available to deliver 24, 28, 35, and 40 percent O_2 concentrations, respectively.

*Indicates optional skill.

- b. Point out that advantage is that these masks provide for administration of consistent low concentrations
 - c. Discuss disadvantages: restrictive as in other mask methods and the maximum percentage is relatively low
- 5. Discuss demand-valve use for the breathing patient.
 - a. Advantage: provides a means of delivering O_2 with positive pressure
 - b. Disadvantage: gives dry oxygen
- C. Complications may include respiratory depression in some patients with COPD.
- D. Humidification
 - 1. Respiratory mucosa requires moisture.
 - 2. Unhumidified gas dries the respiratory tract.
 - 3. Heated humidification is most effective.
 - 4. Cold bubble humidifiers are used in prehospital care.
 - a. Fifty-percent humidity at the humidifier means only 20 percent is provided at body temperature.
 - b. The remaining moisture is evaporated from the mucociliary blanket.
 - 5. Humidification should be provided if oxygen is to be delivered for longer than 10 minutes.
 - 6. A relatively healthy person can tolerate cold bubble humidification.
 - 7. Water used in the reservoir should be sterile.
 - 8. Demonstration 4.1.1.S

4.2. Use of adjuncts

- A. Head and jaw—must be in a favorable position for unobstructed ventilation
 - 1. Point out that the simplest position is the backward head tilt, which hyperextends the patient's neck.
 - 2. Discuss the triple airway maneuver.
 - a. Forcefully displaces the mandible forward
 - b. Tilts the head backward
 - c. Retracts the patient's lower lip
 - 3. Point out that such maneuvers should be attempted before the use of airway adjuncts.

- a. Point out that adjuncts may be used if these maneuvers cannot easily maintain an open airway.
 - b. Point out that proper head position is maintained with airway adjuncts.
- B. Oropharyngeal airway—conforms to the curvature of the palate
1. Point out that it extends from the lips to the pharynx.
 2. Point out that it is available in many sizes.
 3. Point out that it is used in the *unconscious* patient to maintain a patent airway—hyperextension is still critical.
 4. Point out that it is inserted upside down and rotated into position.
 5. Ask the students to list its uses.
 6. Point out that it may cause gagging in a conscious patient.
- C. Nasopharyngeal airway
1. Point out that a soft rubber catheter is passed through the nose.
 2. Point out that it extends from the nostril to the pharynx, to just below the base of the tongue.
 3. Point out that diameters range from 26 to 32 French.
 4. Point out that proper patient length is 1 inch longer than the distance between the nostril and the tragus of the ear.
 5. Discuss the disadvantages.
 - a. Airway may easily kink
 - b. May injure the nasal mucosa upon insertion
 - c. Lumen of catheter increases airway resistance
- D. Pocket mask
1. Point out that it is for use in the patient requiring respiratory assistance or support.
 2. Point out that it is placed over the patient's mouth and nose with an airtight seal, triple airway maneuver.
 3. Point out that it may be hooked up to O₂.
 4. Discuss the advantages and disadvantages.
- E. Bag-valve mask
1. Point out that it is for use in the patient requiring respiratory assistance or support.
 2. Point out that the assembly or unit to be used includes bag, valve, mask, and O₂ and reservoir tubing.

3. Point out that the attachments include infant mask, adult mask, extension tube, and right-angle adapter.
4. Point out that with reservoir tubing, the O_2 concentration = 98 percent.
5. Point out that without reservoir tubing, the O_2 concentration = 50 percent.
6. Point out that it may be used in conjunction with an oropharyngeal airway; without a mask, it can be used with an endotracheal tube or esopharyngeal obturator airway.
7. Discuss the advantages: high concentration delivery, works well in cardiopulmonary resuscitation (CPR), can deliver humidified O_2 , can be used without O_2 , and can be used for respiratory assistance.
8. Discuss the disadvantages.
9. Ask the students which type they prefer and discuss.
10. Introduce Demonstration 4.2.1.S

4.3. Demand valve

- A. Point out that it is for use in the patient requiring respiratory assistance and positive-pressure ventilation.
- B. Discuss the assembly and function of the unit.
- C. Point out that it can be used with compressed air or pure O_2 .
 1. With O_2 , concentration = 100 percent
 2. With air, concentration = 21 percent
- D. Discuss the advantages. (ask students)
 1. Easy to use
 2. High concentration can be delivered
 3. Can be used as a demand device or in an IPPV
 4. Can be held at a distance from a breathing patient to enrich the room air
- E. Discuss the disadvantages. (ask students)
 1. Mechanical device can break down
 2. Requires compressed gas
 3. Nonhumidified gas is delivered
 4. Distends the stomach and promotes vomiting
 5. Lungs can be overinflated
- F. Present Demonstration 4.3.1.S.

4.4. Suctioning

- A. Point out that it is for use in the patient who has excessive secretions in the oropharynx and trachea
- B. Discuss the types of units, their function and assembly.
 - 1. Piston
 - 2. Pressurized gas-powered (O_2 and freon)
 - 3. Foot
 - 4. Vehicle-mounted manifold—vacuum
- C. Discuss the types of catheters—their uses and sizes.
 - 1. Whistle-tip
 - 2. French
 - 3. Rigid (tonsil tip)
- D. Discuss the techniques with and without adjunctive airways present.
- E. Discuss the technique with an endotracheal tube in place.
 - 1. Patient should be preoxygenated with 100-percent oxygen for 3 minutes before each suctioning attempt.
 - 2. Patient should be monitored for arrhythmias.
 - 3. Sterile gloves should be used.
 - 4. Suction catheter must be sterile.
 - 5. Catheter should be inserted as far as possible with the suction off.
 - 6. Catheter should be suctioned and rotated upon withdrawal; do not take more than 10 seconds.
 - 7. System should be flushed with sterile saline, and the procedure repeated.
- F. Present Demonstration 4.4.1.S.

4.5. Use of nebulizers

- A. Purpose of nebulization
- B. Hand powered—with bulb squeezed by hand
- C. Gas powered—most often button activated, employing freon propellants
- D. Demonstration 4.5.1.S.

4.6. Direct laryngoscopy

- A. Point out that before any tracheal cannulation procedure can begin, the epiglottis and vocal cords must be visualized.

- B. Discuss the laryngoscope.
 - 1. Blade (curved or straight) with a light
 - 2. Handle
- C. Discuss the use of the laryngoscope.
 - 1. Select a blade.
 - 2. Check the light to see if it is functional.
 - 3. Insert with the tongue in midline; with a Macintosh blade, the tongue is pushed to the left.
 - 4. Use a lifting motion with the wrist locked.
- D. Point out that it can be used for visualization and removal of upper airway obstructive material (Magill forceps).

4.7. Endotracheal intubation

- A. Airway control
 - 1. Protects the airway from aspiration
 - 2. Permits an IPPV with 100-percent oxygen
 - 3. Provides access to the tracheobronchial tree for suctioning
 - 4. Does not cause gastric distention
 - 5. Maintains a patent airway in patients who would develop obstruction despite the use of oropharyngeal or nasopharyngeal airways
- B. Hazards
 - 1. Inadvertent intubation of the esophagus
 - 2. Passage of the tube past the carina into the right mainstem bronchus
- C. Equipment
 - 1. Several sizes of blades and tubes—usually 8 or 9 millimeters internal diameter tube for an adult
 - 2. Additional light bulbs and batteries
 - 3. Suction and oxygen administration equipment
 - 4. Water-soluble lubricating jelly
 - 5. Magill forceps and bite block or oropharyngeal airway
 - 6. Syringe
 - 7. Hemostat
 - 8. Benzoin, surgical sponges, and tape
- D. Procedure
 - 1. During intubation, life-support measures (i.e., CPR) must be stopped for only 15 seconds.
 - 2. Patient must be preoxygenated.

3. Procedure outlined assumes no cervical spine injury is present.
4. Performer will have less than 30 seconds to complete the intubation procedure.

4.8.* Esophageal obturator airway

- A. Point out that it is designed to intubate and block the esophagus.
- B. Point out that after the tube is in place and the cuff inflated, the esophagus is sealed.
- C. Point out that it prevents:
 1. Gastric distention during an IPPV
 2. Regurgitation during an IPPV
- D. Discuss contraindications.
 1. Conscious or semiconscious patients
 2. Patients under 16 years of age
 3. Known esophageal disease
 4. Cirrhosis of the liver
 5. Ingestion of caustic substances
- E. Discuss the technique for insertion.
- F. Point out that the tube should not be removed unless:
 1. Patient is breathing spontaneously, effectively, and is resisting the airway
 2. Patient has an endotracheal tube in place
- G. Point out that when the tube is removed, most patients regurgitate—suction unit *must* be available.
- H. Discuss the advantages. (ask the students)
 1. Point out that it prevents gastric distention and aspiration.
 2. Point out that it requires no visualization of the patient's airway.
- I. Discuss the disadvantages. (ask the students)
 1. When removed, regurgitation occurs in a significant number of patients.
 2. It is available in one adult size only.
 3. It does not provide a direct method of tracheal control.
 4. It may be inadvertently inserted in the trachea.
 5. There have been cases of esophageal rupture.
- J. Present Demonstration 4.8.1.S.

*Indicates optional skill.

4.9.* Thoracic decompression

- A. Point out that upon any direct communication of a pulmonary air space with the pleural cavity, a one-way ball valve may be created.
- B. Point out that air cannot escape from the pleural cavity.
- C. Point out that lung collapse will occur under tension.
- D. Point out that pressure against the venae cavae results, reducing cardiac output.
- E. Point out that tension must be released promptly.
- F. Demonstrate the technique for insertion of a 12- or 14-gage catheter with flutter valve attached—alternative method—improvised flutter valve.
- G. Discuss what makes this technique difficult.

4.10. Positive-End Expiratory Pressure (PEEP)

- A. Discuss the indications for use—high degrees of shunt.
- B. Describe the device. (draw a diagram)
 - 1. Main body of the Boehringer valve
 - 2. Connections to the oxygen source
 - 3. Calibrated ball
- C. Discuss other devices used to deliver PEEP.
- D. Present Demonstration 4.10.1.S.

4.11.* Cricothyroidotomy

- A. Point out that it is a technique to be used after tracheal intubation has been attempted or is infeasible.
- B. Point out that it may be indicated in cases of:
 - 1. Severe swelling of the upper airway, epiglottis, or larynx
 - 2. Fractured cervical vertebrae
- C. Point out where the cricoid cartilage is located.
 - 1. Just below the thyroid cartilage
 - 2. Below the junction between the larynx and trachea
- D. Point out that the incision is made in the cricothyroid membrane—the area between the thyroid and cricoid cartilages.

*Indicates optional skill.

- E. Discuss the cricothyrotome.
 - 1. Sizes available
 - 2. Use
 - 3. Care after insertion
- F. Discuss alternate methods.
 - 1. Discuss the use of a scalpel.
 - 2. Discuss the use of makeshift tubular devices for an airway (e.g., 10-gage over-the-needle catheter).
 - 3. Point out that disadvantages include the lack of sterility, unreliability, and possible bleeding.
- G. Discuss the frequent need for this procedure in the field, and ask the students for situations observed in their careers.

4.12.* Transtracheal jet insufflation

- A. Point out that it is a technique to ventilate a patient with a grossly obstructed upper airway.
- B. Point out that it involves the use of a number 10 venous cannulation set and compression O₂ with a pressure regulator to deliver 50 psi.
- C. Point out that the procedure requires the insertion of the needle through the cricothyroid membrane and into the trachea.
- D. Present Demonstrations 4.9.1.S, 4.11.1.S, and 4.12.1.S.

*Indicates optional skill.

Demonstration 4.1.1.S: Administration of Oxygen***Equipment***

Oxygen cylinder
Regulator
Oxygen flow meter
Bubble humidifier with sterile water
Demand-valve unit
Nasal cannula
Partial rebreathing mask
Venturi mask

Procedure

Position a student in front of the class to act as a patient.

Make sure all the students can see.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps

1. Observe the oxygen cylinder for "100-percent USP" marking.
2. Remove the protective cap from the tank. Stand to the side of the tank.
3. Crack the tank, then close it.
4. Attach the regulator and flow meter to the tank.
 - a. Flow meter in the "off" position
 - b. Align the pin index safety system
 - c. Maintain alignment while tightening the screw and handle
5. Connect the selected method of administration to the oxygen source and bubble humidifier.
6. Open the regulator valve and adjust the flow.
7. Apply the selected device to the "patient."
 - a. Explain all procedures to the patient.

- b. Adjust the device to fit as designed (this step does not apply to the demand valve).
8. Check the flow meter and adequacy of flow to the patient (does not apply to demand valve).
9. Remove the selected device from the patient and turn off the oxygen.
10. "Bleed" the gage and return to the "off" position.
11. Follow the same procedure for all other methods listed above.

NOTES

Demonstration 4.2.1.S: Use of Adjuncts

Equipment

Oropharyngeal airway
Nasopharyngeal airway with safety pin
Water-soluble lubricating jelly
Pocket mask
Bag-valve mask with tubing
Oxygen cylinder
Regulator
Oxygen flow meter
Bubble humidifier
Adult manikin

Procedure

Position all equipment in front of the class so it is readily accessible.

Position the manikin so all the students can see.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps

1. Insertion of an oropharyngeal airway:
 - a. Select an airway of the correct size (measure from lips to pharynx).
 - b. Open the mouth using a cross-finger maneuver.
 - c. Holding the flange end, turn the airway so the tip is facing upward (toward the patient's soft palate).
 - d. Insert the airway into the mouth.
 - e. When the airway is halfway in, rotate it 180°.
 - f. Insert the rest of the way, being careful not to entrap the lips.

NOTES

2. Insertion of a nasopharyngeal airway:
 - a. Select an airway of the correct size (largest diameter that will fit—slightly smaller than the nostril opening).
 - b. Insert a safety pin transversely through the nasal end.
 - c. Lubricate the outside distal end of the airway.
 - d. Insert its entire length into the nostril.
 - e. Check for air exchange.
3. Use of the pocket mask for IPPV:
 - a. Remove the mask from the case and inflate the mask seal.
 - b. Clamp the mask to the patient's face with two hands by hyperextending the patient's neck, spreading and molding the mask over the patient's nose.
 - c. Blow into the mask and then remove your mouth from the mask as in mouth-to-mouth resuscitation (maintain the mask seal).
 - d. Observe for exhalation (chest falling).
 - e. Check for aspiration.
 - f. Demonstrate use with oxygen.
4. Use of the bag-valve mask for IPPV:
 - a. Choose the proper size mask.
 - b. Properly insert the oropharyngeal airway.
 - c. Mold the mask over the patient's mouth and nose.
 - d. Clamp the mask to the face using either:
 - (1) "C" clamp—thumb at the nose part and index finger at the chin part of the mask, while middle, ring, and little fingers pull the patient's chin
 - (2) Palm over the center of the mask (forcing the mask to seal) with finger tips pulling the patient's chin upward and backward
 - e. Hyperextend the patient's neck (if method d2 has been used, this has been accomplished).
 - f. Squeeze the bag (with fingers on one side and thumb on the other side) until the chest rises.
 - g. Release the bag and observe for exhalation.
 - h. Connect the oxygen tubing and reservoir tube to the bag-valve-mask unit.
 - i. Adjust the liter flow.
 - j. Ventilate as above.

Demonstration 4.3.1.S: Use of Demand-Valve Unit for IPPV

Equipment

Adult manikin
Demand-valve unit
Oropharyngeal airway

Procedure

Position equipment in front of the class so it is easily accessible.

Position the manikin so all students can see.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps

1. Connect demand-valve unit to the O₂ cylinder.
2. Open the O₂ cylinder.
3. Insert an oropharyngeal airway.
4. Position the mask and mold it to the patient's face.
5. Clamp the mask using the "C" clamp method (described in Demonstration 4.2.1) and exert downward pressure while holding the valve.
6. Hyperextend the manikin's neck.
7. Depress the button until the chest rises.
8. Release the button and observe for exhalation.

NOTES

Demonstration 4.4.1.S: Use of a Piston-Powered Suction Unit***Equipment***

Piston-powered suction unit

Sterile water

Sterile suction catheters:

- a. Rigid
- b. Flexible

Oropharyngeal airway

Adult manikin

Adult intubation manikin with tube inserted

Sterile gloves

Procedure

Position the equipment in front of the class so it is easily accessible.

Intubate the intubation manikin before the demonstration begins.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps

Demonstrate the following skills on an adult manikin:

1. Open the unit and prepare for suctioning (select a catheter type).
2. Show the location and describe the function and cleaning of the following parts:
 - a. Suction unit
 - b. Power pack
 - c. Connecting tubing
 - d. Adapter
 - e. Catheter (types and sizes)

3. Turn the unit on (describe the different speeds).
4. Place the catheter in a water bottle to check the operation of the unit.
5. Open the patient's mouth (cross-finger maneuver) and insert the catheter. Be sure to:
 - a. Determine the proper length of insertion
 - b. Remove suction from the tip during inspection
6. Move the catheter around and apply suction for approximately 10 seconds.
7. Remove the catheter and flush the system with water.
8. Repeat as necessary.
9. Repeat demonstration steps 3-8 using another type of catheter.

Demonstrate the following on an adult intubation manikin with a tube previously inserted (patient should be connected to a cardiac monitor):

1. Preoxygenate the patient for 3 minutes with 100-percent oxygen (bag-valve device with reservoir).
2. While an assistant ventilates, assemble the equipment and put on sterile gloves.
3. Make sure the assistant then disconnects the bag and introduces the catheter into the tube (the catheter must not touch the outside of the tube).
4. Advance the catheter as far as possible with the suction off.
5. Apply intermittent suction as the catheter is slowly withdrawn and rotated. Do not take more than 10 seconds.
6. Repeat the insertion and withdrawal procedure as necessary after repeating step 1 between every attempt.
7. Flush the catheter with sterile saline and apply suction to the nasopharynx with the same catheter.

Explain that a new sterile catheter must be used for the endotracheal tube after the catheter has been used in the nose, mouth, or throat.

8. Watch the monitor for the appearance of cardiac arrhythmias. (If they occur, cease suctioning, withdraw the catheter, and bag the patient with 100-percent oxygen.)

Demonstration 4.5.1.S: Use of Nebulizers*Equipment*

Hand-powered nebulizer
Gas-powered nebulizer

Procedure

Position the equipment in front of the class so it is easily accessible.

Position a student in front of the class to act as a patient.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps

1. Preparation of a hand-powered nebulizer.
2. Explanation of the procedure to the patient.
3. Use of a hand-powered nebulizer.
4. Preparation of a gas-powered nebulizer.
5. Explanation of the procedure to the patient.
6. Use of a gas-powered nebulizer.

Demonstrations 4.6.1.S and 4.7.1.S: Direct Laryngoscopy and Endotracheal Intubation*Equipment*

Adult intubation manikin
Infant intubation manikin
Laryngoscope with assorted blades
Endotracheal tube set
10-cc syringe
Hemostat
Water-soluble lubricating jelly
Magill forceps
Bite blocks or oropharyngeal airway
Surgical sponges
Tape
Bag-valve-mask unit with adapter elbow

Procedure

Place all equipment in front of the class so it is easily accessible.

Make sure all students can see.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps

Demonstrate on an adult intubation manikin the following skills:

1. Continue ventilations during the preparation for direct laryngoscopy and intubation.
2. Assemble the laryngoscope blade and handle.
3. Check the light to be sure it is bright white and steady.
4. Select the proper size tube.
5. Check the tube cuff for leaks by inflation and then deflate.

6. Lubricate the end of the tube.
7. Hyperventilate the patient.
8. Insert the laryngoscope with the tongue in midline. (Explain the difference in technique with straight versus curved blades.)
9. Visualize the epiglottis, then the vocal cords.
10. Insert the tube so the cuff is 1 inch beyond the vocal cords.
11. Inflate the cuff with enough air to prevent a leak (5–10 cc).
12. Clamp the air tubing without taking your hand off the tube.
13. Insert bite blocks or an oropharyngeal airway.
14. Remove the laryngoscope.
15. Oxygenate the patient and suction as necessary.
16. Auscultate both lungs for breath sounds.
17. Mark the point at which the tube enters the mouth with a marking pencil.
18. Tape the tube into position.

Demonstrate the same skills using the infant intubation manikin, but with an uncuffed tube.

Demonstration 4.8.1.S:* Use of the Esophageal Obturator Airway*Equipment*

Adult intubation manikin
Esophageal obturator airway
30-cc syringe
Endotracheal intubation equipment
Bag-valve unit

Procedure

Position the equipment in front of the class so it is readily accessible.

Make sure all students can see.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps

1. Assemble the airway and mask (with rim inflated).
2. Flex the neck slightly.
3. Grasp the mandible and lift upward.
4. Holding the esophageal airway with the other hand, and with its curvature in the same direction as the natural curvature of the pharynx, insert the tip into the mouth and advance it gently into the pharynx and esophagus. If any resistance is met, pull back and readvance.
5. Advance the airway until the mask can be seated firmly on the face.
6. Mold the mask to the face and blow into the airway or use a bag-valve unit.

*Indicates optional skill.

7. Observe to see if the chest rises (in this case, see if the lungs expand). Auscultate to be certain there is air exchange.
8. Use the syringe to inject up to 30 cc of air through the one-way valve into the obturator cuff.
9. Remove the syringe immediately and continue IPPV.

Demonstrate removal procedures after describing when to remove.

Demonstrate the following skills:

1. If the endotracheal tube is not in place (i.e., the patient has responded to resuscitative attempts and is resisting the airway), turn the patient on his side.
2. Be prepared to suction; most patients will regurgitate at this point.
3. Deflate the obturator cuff by triggering the stem of the one-way valve.
4. Withdraw the airway.
5. Demonstrate intubation with an obturator in place.

Demonstration 4.10.1.S*: Use of a Positive-End Expiratory Device

Equipment

Oxygen cylinder
Regulator
Oxygen flow meter
Bubble humidifier
Boehringer valve
Connecting tubing and bag-valve unit (used only with endotracheal tube in place)

Procedure

Position equipment in front of the class so it is easily accessible.

Use a student as a patient and position him in front of the class.

Make sure all students can see.

Assemble the oxygen delivery system before the demonstration.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps

1. Connect the Boehringer valve to the expiratory port of a bag-valve unit.
2. Ventilate as if providing respiratory assistance to demonstrate the function of the valve upon expiration (valve must be maintained in an exactly vertical position).

Explain that this procedure is usually performed on intubated patients being transported a long distance.

*Demonstration 4.9.1.S is presented next.

Demonstrations 4.9.1.S*, 4.11.1.S*, and 4.12.1.S*: Chest Decompression, Cricothyroidotomy, and Transtracheal Jet Insufflation

Equipment

Demand-valve unit
Cricothyrotome
Laryngoscope with curved and straight blades
Endotracheal tube set
Bag-valve mask with elbow adapter
Stethoscope
12- to 14-gage venous catheterization set
Flutter valve
10-gage venous catheterization set
Alcohol swabs

Procedure

Schedule an animal laboratory with enough dogs to perform at least the number of skills to be demonstrated.

Demonstrate only those skills selected as program options and other skills previously taught.

Assemble all equipment near the subject so it is easily accessible.

Make sure all students can see.

As the skill is demonstrated, describe what is being done. Give detailed instructions including:

- Patient teaching
- Hand position and movements
- Probable results
- Complications
- Critical errors

Steps—Chest Decompression With a Catheter and Flutter Valve

The dog must be given pneumothorax.

1. Locate the second or third intercostal space in the midclavicular line.
2. Prepare the skin.

*Indicates optional skill.

3. Insert a 12- to 14-gage over-the-needle catheter into the pleural cavity.
4. Advance the catheter while holding the needle in position. Remove the needle.
5. Attach a flutter valve to the end of the catheter.
6. Check for air movement caused by escape of positive intrapleural pressure.
7. Tape the catheter in position.

Steps—Cricothyroidotomy

1. Locate the cricothyroid membrane.
2. Prepare the skin.
3. Make an incision.
4. Insert a tracheostomy tube.
5. Check for air exchange.
6. Suction, if necessary.
7. Tie the tracheostomy tube.

Steps—Transtracheal Jet Insufflation

1. Locate the cricothyroid membrane.
2. Prepare the skin.
3. Insert a 10- to 12-gage venous catheter into the trachea.
 - a. Insert at a 45° angle
 - b. Make sure the catheter is pointing toward the lower trachea
4. Withdraw the needle while holding the catheter in position.
5. Check for air exchange.
6. Attach the oxygen source at 100 psi to the catheter.
7. Hold the catheter in position and turn on the oxygen source until the chest rises, then shut it off. Repeat every 5 seconds.
8. Check for ventilation of both lungs by observing for chest movement and auscultating the lungs.
9. Tape the catheter in position (carefully to avoid kinking).

NOTE: Direct laryngoscopy, endotracheal intubation, and other previously covered activities should be demonstrated if the situation permits.

Practice Session 1*Equipment*

Oxygen cylinder (one for every three to four students)
Regulator (one for every three to four students)
Oxygen flow meter (one for every three to four students)
Bubble humidifier (one for every three to four students)
Demand-valve unit (one for every three to four students)
Nasal cannula (one for every student)
Nonrebreather mask (one for every student)
Venturi mask (one for every student)

Skills

4.1.1.S. Administration of oxygen

Procedure

Divide the class into groups of three or four. Each group should be given a complete set of required equipment.

Instruct the students to take turns attaching the regulator, flow meter, and humidifier to the tank.

Once this has been accomplished, instruct the students to take turns acting as the patient, simulating various conditions requiring oxygen administration. The performer should select the best method of administration (as defined by the instructor) for the simulated problem. Enough simulated situations should be presented to allow each student to select and apply all methods listed.

Practice Session 2*Equipment*

Oropharyngeal airway (one for every three to four students)
Nasopharyngeal airway with safety pin (one for every three to four students)
Pocket mask (one for every three to four students)
Bag-valve-mask unit with tubing (one for every three to four students)
Adult manikin (one for every three to four students)

Water-soluble jelly lubricant (one for every three to four students)
Oxygen cylinders (one for every three to four students)
Regulator (one for every three to four students)
Flow meter (one for every three to four students)
Bubble humidifier (one for every three to four students)

Skills

- 4.2.1.S Insertion of an oropharyngeal airway
- 4.2.1.S Insertion of a nasopharyngeal airway
- 4.2.1.S Ventilation of a patient using a pocket mask and O₂
- 4.2.1.S Ventilation of a patient using a bag-valve mask
- 4.2.1.S Ventilation of a patient using a bag-valve mask with oxygen support
- 4.2.2.S Cleaning of the bag-valve mask
- 4.3.2.S Cleaning of the demand-valve unit

Procedure

Divide the class into groups of three or four.
Give each group a complete set of equipment as described above.
Instruct each student to practice the listed skills on the manikin.

Practice Session 3

Equipment

Adult manikin (one for every three to four students)
Demand-valve unit (one for every three to four students)
Oropharyngeal airway (one for every three to four students)

Skills

- 4.2.1.S Insertion of an oropharyngeal airway
- 4.3.1.S Ventilation of a patient using demand-valve unit

Procedure

Divide the class into groups of three or four.
Give each group a complete set of equipment as described above.
Instruct each student to practice the skills listed.

Practice Session 4***Equipment***

Piston-powered suction unit (one for every three to four students)
Sterile water in container (one for every three to four students)
Sterile suction catheters (one for every three to four students)

- Rigid
- Flexible

Oropharyngeal airway (one for every three to four students)
Adult manikin (one for every three to four students)
Sterile gloves (one for each student)
Adult intubation manikin with tube inserted (one for class)

Skills

- 4.2.1.S Insertion of an oropharyngeal airway
- 4.4.1.S Operation of a piston-powered suction unit and suctioning of the trachea
- 4.4.2.S Cleaning of a piston-powered suction unit

Procedure

Divide the class into groups of three.

Give each group a set of equipment as described above (excluding the intubation manikin).

Instruct students to practice the listed skills, with the exception of tracheal suctioning.

Instruct each student to report to the instructor one at a time to work with the instructor on tracheal intubation.

Practice Session 5***Equipment***

Hand-powered nebulizer (one for every three to four students)
Gas-powered nebulizer (one for every three to four students)

Skills

4.5.1.S Use of hand-powered and gas-powered nebulizer

Procedure

Divide the class into groups of three.

Instruct students to take turns practicing the skills on each other until all students have practiced the skills.

Practice Session 6

Equipment

Adult intubation manikin (one for every three to four students)

Infant intubation manikin (one for every three to four students)

Laryngoscope with assorted blades (one for every three to four students)

Endotracheal tube set (one for every three to four students)

10-cc syringe (one for every three to four students)

Hemostat (one for every three to four students)

Water-soluble lubricating jelly (one for every three to four students)

Magill forceps (one for every three to four students)

Bite blocks or oropharyngeal airway (one for every three to four students)

Surgical sponges (one for every three to four students)

Tape (one for every three to four students)

Bag-valve-mask unit with adapter elbow (one for every three to four students)

Skills

4.6.1.S Direct laryngoscopy

4.7.1.S Endotracheal intubation on an adult and infant manikin

Procedure

Divide the class into groups of three.

Give each group a set of equipment as described above.

Instruct them to practice the skills listed.

Practice Session 7***Equipment**

Adult intubation manikin (one for every three students)

Water-soluble lubrication jelly, tube (one for every three students)

(do not use with manikin, simulate)

Esophageal airway, kit (one for every three students)

Endotracheal intubation kit (one for every three students)

Skills

4.8.1.S Use of the esophageal obturator airway

Procedure

Divide the class into groups of three.

Give each group a complete set of the equipment listed.

Instruct each group to take turns practicing insertion as demonstrated and then removal as demonstrated.

Practice Session 8**Equipment**

Oxygen cylinder (one for every three to four students)

Regulator (one for every three to four students)

Oxygen flow meter (one for every three to four students)

Bubble humidifier (one for every three to four students)

Boehringer valve (one for every three to four students)

Connecting tubing and bag-valve unit (used only with endotracheal tube in place) (one for every three to four students)

Oxygen mask (one for each student)

Skills

4.10.1.S Use of a positive-end expiratory pressure device

*Indicates optional skill.

Procedure

Divide the class into groups of three.

Give each group a set of equipment as described above.

Instruct the students to take turns practicing the skill until all have had an opportunity.

Practice Session 9

Equipment

Demand-valve unit (one for every three to four students)

Cricothyrotome (one for every three to four students)

Laryngoscope with curved and straight blades (one for every three to four students)

Endotracheal tube set (one for every three to four students)

Bag-valve mask with elbow adapter (one for every three to four students)

Box of alcohol swabs (one for every three to four students)

Stethoscope (one for each student)

12- to 14-gage venous catheterization set (one for each student)

Heimlich valve (one for each student)

10-gage venous catheterization set (one for each student)

Skills

4.4.1.S Suctioning

4.6.1.S Direct laryngoscopy

4.7.1.S Tracheal intubation

4.9.1.S Chest decompression

4.11.1.S Cricothyroidotomy

4.12.1.S Transtracheal jet insufflation

Procedure

Prior to this practice session, post a schedule of animal lab availability and instruct the student to sign up for the time periods available. The number of students per time period will depend on the size of the lab and the number of animals available.

Instruct the students to practice the skills listed.

Make sure an instructor (or an assistant) is at each practice session to assist each student.

Note that this practice session may be done in conjunction with Demonstrations 4.4.9.S, 4.4.10.S, 4.4.11.S, and 4.4.12.S, including followup practice sessions.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

NOTES

Skill Evaluation 4.1.1.S: Administration of Oxygen

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Oxygen cylinder (one for every station)

Regulator (one for every station)

Oxygen flow meter (one for every station)

Bubble humidifier with sterile water (one for every station)

Demand-valve unit (one for every station)

Nasal cannula (one for each student)

Nonrebreather mask (one for each student)

Venturi mask (one for each student)

Procedure

Set up evaluation stations with one set of equipment each (the number of instructors will determine the number of stations).

Have students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation station(s) in teams of two.

One student should be instructed to demonstrate the skills while the other student acts as a patient. After all skills are evaluated, the students switch roles.

As the students complete their evaluation, instruct them to return to the waiting area to send another team to the station.

Steps—Nasal Cannula

- — — A. Observe oxygen cylinder for “100-percent USP” marking.
- — — B. Remove the protective cap. Stand to the side of the tank.
- — — C. Crack the tank. Close.
- — — D. Apply regulator and flow meter to the tank:
 - — — 1. Flow meter in the “off” position.
 - — — 2. Align the pin in lex system.
- — — E. Attach the bubble humidifier.
- — — F. Connect the nasal cannula to the oxygen source.
- — — G. Open the regulator valve and adjust the liter flow.
- — — H. Explain the procedure to the patient.
- — — I. Apply the nasal cannula to the patient and adjust.
- — — J. Check the flow meter and adequacy of flow to the patient.
- — — K. Remove the nasal cannula carefully from the patient.
- — — L. “Bleed” the gage and return to the “off” position.
- — — M. Remove the nasal cannula from the oxygen source.

NOTES

Steps—O₂ Reservoir

- — — A. Connect the mask to the oxygen source.
- — — B. Explain procedures to the patient.
- — — C. Apply the mask to the patient and adjust.
- — — D. Check the flow meter and be certain the bag fills between inhalations.
- — — E. Remove the mask carefully from the patient.
- — — F. "Bleed" the gage and return to the "off" position.
- — — G. Remove the mask from the oxygen source.

Steps—Venturi Mask

- — — A. Connect the mask to the oxygen source.
- — — B. Explain procedures to the patient.
- — — C. Apply the mask to the patient and adjust.
- — — D. Check the flow meter and adequacy of flow to the patient.
- — — E. Remove the mask carefully from the patient.
- — — F. "Bleed" the gage and return to the "off" position.
- — — G. Remove the mask from the oxygen source.

Steps—Demand-Valve Unit

- — — A. Explain procedures to the patient.
- — — B. Open the regulator at the tank.

- _____ C. Position the mask on the patient's face for demand administration.

(At this point, allow the patient to go through at least three respiratory cycles and then tell the student, "Your patient feels the mask is suffocating him and he cannot breathe.")

- _____ D. Remove the mask from the patient's face and create an oxygen-enriched atmosphere.

(Allow the patient to go through at least three respiratory cycles and then tell the student, "Prepare the unit for storage.")

- _____ E. Release the button and turn off the regulator at the tank.

- _____ F. "Bleed" the valve.

(Ask the student to explain cleaning procedures.)

- _____ G. Clean.

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

NOTES

Skill Evaluation 4.2.1.S: Use of Adjuncts

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Oropharyngeal airway (one for every station)

Nasopharyngeal airway (one for every station)

Water-soluble lubricating jelly (one for every station)—for
simulation

Pocket mask (one for every station)

Bag-valve mask with tubing, reservoir (one for every station)

Oxygen cylinder (one for every station)

Regulator (one for every station)

Oxygen flow meter (one for every station)

Bubble humidifier (one for every station)

Adult manikin (one for every station)

Procedure

Set up evaluation stations with one set of equipment each (the number of instructors will determine the number of stations).

Have students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation station individually.

As the student completes his evaluation, instruct him to return to the waiting area to send another student to the station.

Steps—Nasopharyngeal Airway

- ___ ___ ___ A. Select the correct size.
- ___ ___ ___ B. Insert a safety pin transversely through the nasal end.
- ___ ___ ___ C. Lubricate the outside distal end. (Simulate.)
- ___ ___ ___ D. Insert its entire length into the nostril.
- ___ ___ ___ E. Check for air exchange.
- ___ ___ ___ F. Remove.

Steps—Oropharyngeal Airway

- ___ ___ ___ A. Select the correct size.
- ___ ___ ___ B. Open the mouth using the cross-finger maneuver.
- ___ ___ ___ C. Insert and rotate the airway.
- ___ ___ ___ D. Check the position.
- ___ ___ ___ E. Tilt the head.

Steps—Pocket Mask

- ___ ___ ___ A. Remove the mask from the case and inflate the seal.
- ___ ___ ___ B. Clamp the mask to the patient's face by:
 - ___ ___ ___ 1. Hyperextending the patient's neck.
 - ___ ___ ___ 2. Spreading and molding the mask over the mouth and nose.

- — — C. Blow into the mask and then withdraw mouth while maintaining seal.
- — — D. Check for exhalation.
- — — E. Repeat with O₂—demonstrate how to use O₂ alone with rescuer exhaling.

(Allow student to ventilate for three respiratory cycles, then tell student, "Use the bag-valve-mask unit.") Assume that the oropharyngeal airway is still in position. If not, it must be inserted as above.

Steps—Bag-Valve Mask

- — — A. Choose the proper size mask.
- — — B. Mold the mask over the patient's mouth and nose.
- — — C. Clamp the mask to the patient's face using:
 - — — 1. "C" clamp
 - — — 2. Palm pressure method
- — — D. Hyperextend the patient's neck.
- — — E. Squeeze the bag to ventilate.
- — — F. Release the bag while maintaining the seal.
- — — G. Observe for exhalation.

(Allow the student to ventilate for five respiratory cycles and then tell the student, "Ventilate with oxygen support.")

- — — H. Connect the oxygen tubing.
- — — I. Open the regulator at the tank.
- — — J. Adjust the liter flow.

— — — K. Connect the reservoir tubing.

— — — L. Ventilate as before.

(Allow the student to ventilate the patient for three complete respiratory cycles and then tell the student, "Stop and prepare equipment for storage.")

— — — M. "Bleed" the flow gage and return to the "off" position.

— — — N. Disconnect the bag-valve mask from the oxygen source.

(Ask the student to explain cleaning procedures for the bag-valve-mask unit.)

— — — O. Clean.

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

NOTES

Skill Evaluation 4.3.1.S: Use of Demand-Valve Unit for IPPV

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Adult manikin
Oropharyngeal airway
Demand-valve unit

Procedure

Set up evaluation stations with one set of equipment each (the number of instructors will determine the number of stations).

Have the students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation stations individually.

As each student completes his evaluation, instruct him to return to the waiting area to send another student to the station.

Steps

- ___ ___ ___ A. Connect the demand valve to O₂ cylinder.
- ___ ___ ___ B. Open the regulator at the tank.
- ___ ___ ___ C. Insert an oropharyngeal airway.
- ___ ___ ___ D. Position the mask on the patient's face.

— — — E. Clamp the mask to the patient's face using the "C" clamp method.

— — — F. Hyperextend the patient's neck.

— — — G. Depress the button to ventilate and release when the chest rises.

— — — H. Observe for exhalation while maintaining the seal.

(Allow the student to ventilate the patient for five respiratory cycles, then tell the student, "Stop and prepare the unit for storage.")

— — — I. Turn off the regulator valve.

— — — J. "Bleed" the demand valve.

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 4.4.1.S: Use of a Piston-Powered Suction Unit

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Piston-powered suction unit

Oropharyngeal airway

Adult manikin

Adult intubation manikin with a tube inserted and connected to a cardiac monitor (monitor can be simulated)

Container of sterile water (can be simulated)

Sterile suction catheters

- Rigid
- Flexible

Sterile gloves

Procedure

Set up evaluation stations with one set of equipment each (the number of instructors will determine the number of stations).

Have students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation stations individually.

As each student completes his evaluation, he should return to the waiting area to send another student to the station.

NOTES

Steps—Adult Manikin

- ___ ___ ___ A. Open the unit and prepare for suctioning.
- ___ ___ ___ B. Connect one of the catheters to the unit.
- ___ ___ ___ C. Turn the unit on.
- ___ ___ ___ D. Place the catheter in water.
- ___ ___ ___ E. Open the patient's mouth with a cross-finger maneuver.
- ___ ___ ___ F. Insert the catheter.
 - ___ ___ ___ 1. Remove suction from the tip on insertion.
 - ___ ___ ___ 2. Insert a catheter of proper length.
- ___ ___ ___ G. Suction for approximately 10 seconds.
- ___ ___ ___ H. Remove the catheter from the patient and flush the system with water.

Steps—Adult Intubation Manikin (with tube inserted and connected to a cardiac monitor)

- ___ ___ ___ A. Preoxygenate the patient by bagging for 3 minutes with 100-percent oxygen.
- ___ ___ ___ B. While an assistant ventilates, assemble the equipment and put on sterile gloves.
- ___ ___ ___ C. Have the assistant disconnect the bag.
- ___ ___ ___ D. Introduce a catheter (with suction off) into the tube, without allowing the catheter to touch outside of tube.

— — — E. Advance the catheter as far as possible with the suction off.

— — — F. Apply intermittent suction while slowly withdrawing the catheter, rotating it as it is withdrawn (must not take longer than 10 seconds).

(Note: Instruct the student to suction the patient again.)

— — — G. Have the assistant reoxygenate the patient as in step A.

— — — H. Have the assistant disconnect the bag.

— — — I. Introduce the catheter (with suction off) into the tube, without allowing the catheter to touch the outside of the tube.

— — — J. Advance the catheter as far as possible with the suction off.

— — — K. Apply intermittent suction while slowly withdrawing the catheter, rotating it as it is withdrawn (must not take longer than 10 seconds).

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 4.5.1.S: Use of Nebulizers

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be allowed three attempts to perform the skill.

Equipment

Hand-powered nebulizer

Gas-powered nebulizer

Procedure

Set up evaluation stations with one set of equipment each (the number of instructors will determine the number of stations).

Have students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation station(s) in teams of two.

Instruct one student to demonstrate the skills while the other student acts as a patient. After all skills are evaluated, the students should switch roles.

As the students complete their evaluation, instruct them to return to the waiting area to send another team to the station.

Steps—Hand-Powered Nebulizer

___ ___ ___ A. Prepare for use.

___ ___ ___ B. Explain procedure to the patient.

___ ___ ___ C. Instruct the patient to open his mouth and inhale.

NOTES

- ___ ___ ___ D. Direct the nozzle toward the patient's mouth.
- ___ ___ ___ E. Squeeze the bulb to dispense the contents.

Steps—Gas-Powered Nebulizer

- ___ ___ ___ A. Prepare for use.
- ___ ___ ___ B. Explain procedure to the patient.
- ___ ___ ___ C. Instruct the patient to open his mouth and inhale.
- ___ ___ ___ D. Direct the nozzle toward the patient's mouth.
- ___ ___ ___ E. Push the button to dispense the contents.

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluations 4.6.1.S and 4.7.1.S: Direct Laryngoscopy and Endotracheal Intubation

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

- Adult intubation manikin
- Infant intubation manikin
- Laryngoscope with assorted blades
- Endotracheal tube set
- 10-cc syringe
- Hemostat
- Water-soluble lubricating jelly (use silicon spray on manikin)
- Magill forceps
- Bite blocks or oropharyngeal airway
- Surgical sponges
- Tape
- Bag-valve-mask unit with adapter elbow

Procedure

Set up evaluation stations with one set of equipment each (the number of instructors will determine the number of stations).

Have students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation stations individually.

As each student completes his evaluation, instruct him to return to the waiting area to send another student to the station.

Steps—Adult Intubation Manikin and/or Infant Intubation Manikin

- — — A. Assemble the laryngoscope blade and handle.
- — — B. Check light operation.
- — — C. Hold laryngoscope in left hand.
- — — D. Insert laryngoscope in right side of mouth, lift, and move tongue to left by moving blade to midline.
- — — E. Visualize epiglottis, then vocal cords.
- — — F. Insert endotracheal tube without activating the red light.
- — — G. Inflate cuff with 4–6 milliliters of air and clamp tube.
- — — H. Check placement of endotracheal tube, ventilate, and auscultate chest with stethoscope.
- — — I. Visualize lung inflations.
- — — J. Inflate the cuff with enough air to prevent a leak (5–10 cc).
- NOTE: Steps E-J should be done without taking the hand off the tube.
- — — K. Clamp the air tubing.
- — — L. Insert a bite block or an oropharyngeal airway.
- — — M. Remove the laryngoscope blade from the patient's mouth.
- — — N. Tape the tube into position.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 4.8.1.3:* Use of the Esophageal Obturator Airway

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Adult intubation manikin
Esophageal obturator airway
Air syringe
Piston-powered suction unit with catheters

Procedure

Set up evaluation stations with one set of equipment each (the number of instructors will determine the number of stations).

Have students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation station(s) individually.

As each student completes his evaluation, instruct him to return to the waiting area to send another student to the station.

Steps

___ ___ ___ A. Assemble the airway and inflate the rim.

___ ___ ___ B. Flex the head slightly or maintain in a neutral position (do not extend).

*Indicates optional skill.

- — — C. Grasp jaws and tongue between thumb and index fingers and lift upwards; or use head tilt but keep mouth open and do not hyperextend the neck.
- — — D. With the mask attached, insert tube into mouth and place so that curvature is the same as pharynx.
- — — E. Advance into esophagus and seal mask firmly over nose and mouth.
- — — F. Ventilate and see if chest rises; inflate obturator cuff with 35 milliliter air syringe.
- — — G. Remove the syringe immediately and continue IPPV.

(Allow the student to ventilate for three complete respiratory cycles and then tell the student, "The patient is breathing spontaneously and is resisting the airway.")

- — — H. Turn the patient on his side.
- — — I. Deflate the obturator cuff.
- — — J. Withdraw the airway.
- — — K. Suction as required.

(Ask the student what usually happens at this point.)

- — — L. Answer "regurgitation" or equivalent.

(Ask the student what should be done if intubation is to be performed.)

- — — M. Intubate with the airway in place and then remove the airway.

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 4.9.1.S:* Chest Decompression

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

12- to 14-gage venous catheterization set

Flutter valve

Procedure

Set up an evaluation station in an animal lab with a prepared subject.

Have students wait in an area separate from the evaluation station.

Instruct the students to report to the evaluation station individually.

As each student completes his evaluation, instruct him to return to the waiting area to send another student to the station.

Steps

___ ___ ___ A. Locate the second or third anterior intercostal space in the midclavicular line.

___ ___ ___ B. Prepare the skin.

___ ___ ___ C. Insert the needle into the pleural cavity.

___ ___ ___ D. Advance the catheter while holding the needle in position. Withdraw the needle.

*Indicates optional skill.

NOTES

- — — E. Clamp the catheter.
- — — F. Attach a flutter valve to the end of the catheter.
- — — G. Check for air movement.
- — — H. Tape the catheter in position.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 4.10.1.S:* Use of a Positive-End Expiratory Pressure Device

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Oxygen cylinder
Regulator
Oxygen flow meter
Bubble humidifier
Boehringer valve
Manikin with endotube in place

Procedure

Set up evaluation stations with one set of equipment each (the number of instructors will determine the number of stations).

Have students wait in an area separate from the evaluation stations.

Instruct the students to report to the evaluation station(s) in teams of two.

Instruct one student to demonstrate the skills while the other student acts as a patient. After all skills are evaluated, the students switch roles.

As the students complete their evaluation, they should return to the waiting area and send another team to the station.

*Indicates optional skill.

NOTES

Steps

— — — A. Connect a Boehringer valve to the expiratory port of a bag-valve unit.

— — — B. Ventilate the patient with a bag-valve unit while maintaining the Boehringer valve in an exactly vertical position.

(Instruct the student, "Disconnect system and prepare it for storage.")

— — — C. Carefully remove the mask from patient.

— — — D. "Bleed" the flow meter.

NOTES

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 4.11.1.S:* Cricothyroidotomy

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Cricothyrotome
Alcohol swabs (box)

Procedure

Set up an evaluation station in an animal lab with a prepared subject.

Have students wait in an area separate from the evaluation station.

Instruct the students to report to the evaluation station individually.

As each student completes his evaluation, instruct him to return to the waiting area to send another student to the station.

Steps

- ___ ___ ___ A. Locate the cricothyroid membrane.
- ___ ___ ___ B. Prepare the skin.
- ___ ___ ___ C. Incise the skin and cricothyroid membrane.
- ___ ___ ___ D. Insert a tracheostomy tube and secure with ties.
- ___ ___ ___ E. Check for air exchange.
- ___ ___ ___ F. Tie the tracheostomy tube in position.

*Indicates optional skill.

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 4.12.1.S: Transtracheal Jet Insufflation

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

10-gage venous catheterization set

Demand-valve unit

Connecting tubing

Alcohol swabs (box)

Procedure

Set up an evaluation station in an animal lab with a prepared subject.

Have students wait in an area separate from the evaluation station.

Instruct the students to report to the evaluation station individually.

As each student completes his evaluation, instruct him to return to the waiting area to send another student to the station.

Steps

___ ___ ___ A. Locate the cricothyroid membrane.

___ ___ ___ B. Prepare the skin.

___ ___ ___ C. Insert a 10-gage venous catheter into the trachea:

*Indicates optional skill.

NOTES

- — — 1. Insert at a 45° angle.
- — — 2. Point it toward the lower trachea.
- — — D. Advance the catheter while holding the needle in position. Withdraw the needle.
- — — E. Attach the source of oxygen at 100 psi to the catheter.
- — — F. Hold the catheter in position and ventilate by turning the O₂ source on and off.
- — — G. Check for ventilation of both lungs by observing and auscultating for chest movement.
- — — H. Tape the catheter in position; avoid kinking.

UNIT 5

emt-p

CLINICAL EXPERIENCE

Description of Unit

In the previous units, the students were trained to perform skills in simulated situations in the classroom. The purpose of the clinical experience is to provide the student with the opportunity to become proficient in the skills presented in the classroom setting.

If a number of modules are being presented together, it is not necessary for the clinical experience to be presented after each module. The clinical experience associated with each module can be combined and presented upon completion of the classroom sessions.

Objectives

The following objectives are proposed for the clinical experience. Because of patient availability, it is possible that all skills listed below may not be performed by the student, but as many skills as possible should be observed and practiced under the supervision of the preceptor.

Intensive Care Unit/Coronary Care Unit

During the experience in the intensive care unit/coronary care unit, the student will have the opportunity to practice on actual patients under direct supervision, and to demonstrate proficiency, to the satisfaction of the preceptor, in each of the following:

- *Perform patient assessment including developing a relevant medical history and doing a physical examination. The assess-

*Indicates optional skill.

NOTES

ment should include, at a minimum, taking and recording vital signs, and auscultation of chest and abdominal sounds.

- Perform orotracheal intubation on an adult patient using a laryngoscope with a curved or straight blade, Magill forceps, and orotracheal tube.
- Assist in the care of patients with endotracheal or tracheostomy tubes and of patients breathing on respirators, including aseptic suctioning.

Operating Room

During the experience in the operating/recovery room, the student will have the opportunity to practice on actual patients under direct supervision, and to demonstrate proficiency, to the satisfaction of the preceptor, in each of the following:

- Maintaining the airway in an unconscious patient using manipulations and positioning of the head, oropharyngeal airways, suctioning, etc.
- Monitoring vital signs of an unconscious patient, including blood pressure, pulse, and respirations, and monitor mental status.
- Performing aseptic, endotracheal, and orotracheal suctioning using a soft rubber catheter or a suction catheter.
- Operating oxygen equipment and administering oxygen using various masks and cannulas—for example, Venturi mask, nasal cannula.
- Assisting in the operation of the mechanical respirators.

Morgue

During the experience in the morgue, the student will have the opportunity to practice on cadavers under direct supervision and to demonstrate the following:

- Performing orotracheal and nasotracheal intubation on an adult patient using a laryngoscope with a curved or straight blade, Magill forceps, and orotracheal tube.

Upon completion of the clinical experience, the trainee should be involved in a supervised internship on the vehicle. During this

internship, the trainee will be supervised by a preceptor (physician, nurse, or certified EMT) in the skills presented during the training program. Guidelines for this internship are identical to those presented for the other clinical areas, and should be used as a reference.

Preceptor Activities

Review the objectives with the course coordinator and discuss which objectives are to be included in the unit activities. If the preceptor has any questions concerning specific skills or procedures, he should be referred to the appropriate module for a review of the materials presented to the student.

Have the student sign in and determine his proper attire, for example, sterile greens.

Review the rules and operating procedures within the unit, making certain to define the student's role within the unit. Any special regulations concerning the student's activities should be defined.

Define those skills that will and will not be included in this instructional unit, but were discussed during the classroom activities.

Review the history, diagnosis, complications, and treatment of each patient in the unit. The activities of the student should not be limited to those specifically defined in the objectives.

For each activity, demonstrate the skill initially, then coach the student through the skill at least one time. Finally, observe the student as he performs the skill.

Supervise the student when he is performing activities within the unit. The preceptor should review critically the student's technique and suggest corrections when appropriate.

Assist and evaluate the student until he is competent in each activity on the checklist.

Answer any of the student's questions concerning activities in the unit or specific patients and their conditions.

Review the objectives for this instructional unit periodically, and discuss the student's progress with respect to the items on the checklist.

Mark the student's activities checklist after each clinical session. The checklist should be marked indicating the number of total observations (O), total attempts to perform the activity by the student (T), and the number of successful attempts (S) for each activity. Once the student has successfully demonstrated the skill to

the satisfaction of the preceptor, the session number during which the preceptor made the evaluation should be entered in the "Completed" column. Any comments should be listed in the appropriate space. Specifically, comment should be made if the student does not become proficient in any given skill. Once the student has successfully demonstrated his proficiency at a given skill, however, he should still continue to perform the skill while in the unit.

Student Activities

The student should:

- Report to the specialty unit on his scheduled date and shift and "sign in" with the supervisor
- Review the rules and operating procedures within the unit with the preceptor, making certain that his role in the unit is defined
- Review the history, diagnosis, complications, and treatment of each patient in the unit
- Observe and participate in unit activities as directed by the preceptor (If the student observes a technique or procedure performed differently from its presentation during the classroom activities, he may question the preceptor about differences observed, but remember that the techniques presented during the lecture may not be the only correct method.)
- Perform each activity on the checklist (when appropriate) under the direct supervision of the preceptor (If the student is unsure of the activity, the preceptor will demonstrate the skill.)
- Review each activity performed with the preceptor, and be sure the preceptor critiques his performance
- Be sure the preceptor marks the checklist after each clinical session
- Develop a log on each patient seen during the experience—the log should include the following information as a minimum:
 - Patient's record identification—use identification number rather than patient's name
 - Major problem—that is, trauma, acute appendicitis
 - Complications
 - Skills and activities observed
 - Skills performed—that is, initiated IV, monitored cardiac activity

The preceptor and the student should review the objectives in the instructional unit and discuss which activities will be included in the experience.

NOTES

Intensive Care Unit/Coronary Care Unit

Student's name _____

MODULE V RESPIRATORY SYSTEM

CLINICAL TRAINING CHECKLIST

Completed	Activities (objectives)	Session number										Comments		
		1		2		3		4		5				
		O	T	S	O	T	S	O	T	S	O	T	S	
	Perform patient assessment													
	Perform orotracheal intubation													
	Assist in tube and airway maintenance													
	Preceptor													
	Date													

Note.—O = observations; T = student attempts; S = successful attempts.

Operating Room

Student's name _____

MODULE V RESPIRATORY SYSTEM

CLINICAL TRAINING CHECKLIST

Completed	Activities (objectives)	Session number										Comments				
		1		2		3		4		5						
		O	T	S	O	T	S	O	T	S	O		T	S		
	Maintain patient's airway— manual method and suctioning															List equipment
	Monitor vital signs															
	Perform orotracheal intubation															
	Operate oxygen equipment															
	Perform suctioning															
	Operate mechanical respirator															
	Preceptor															
Date																

Note.—O = observations; T = student attempts; S = successful attempts.

MODULE V RESPIRATORY SYSTEM

CLINICAL TRAINING CHECKLIST

Student's name _____

[illegible]

Note.—O = observations; T = student attempts; S = successful attempts.